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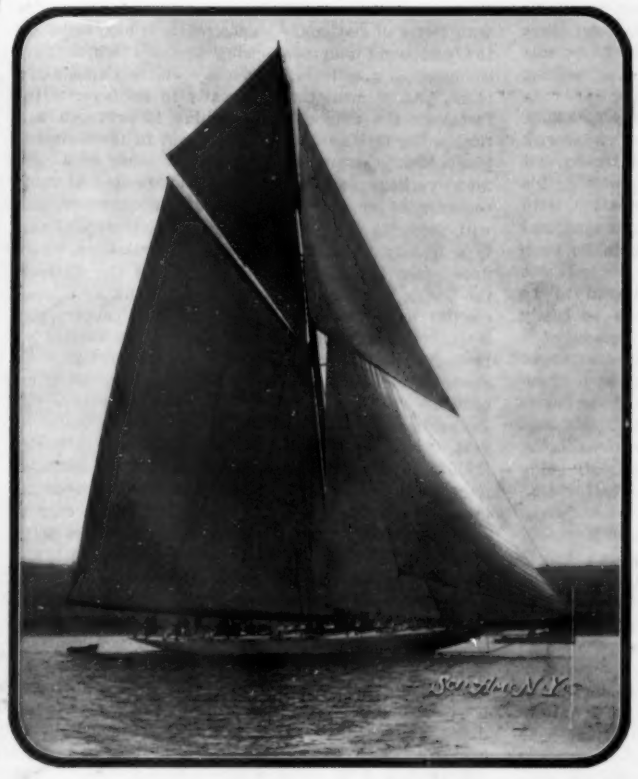
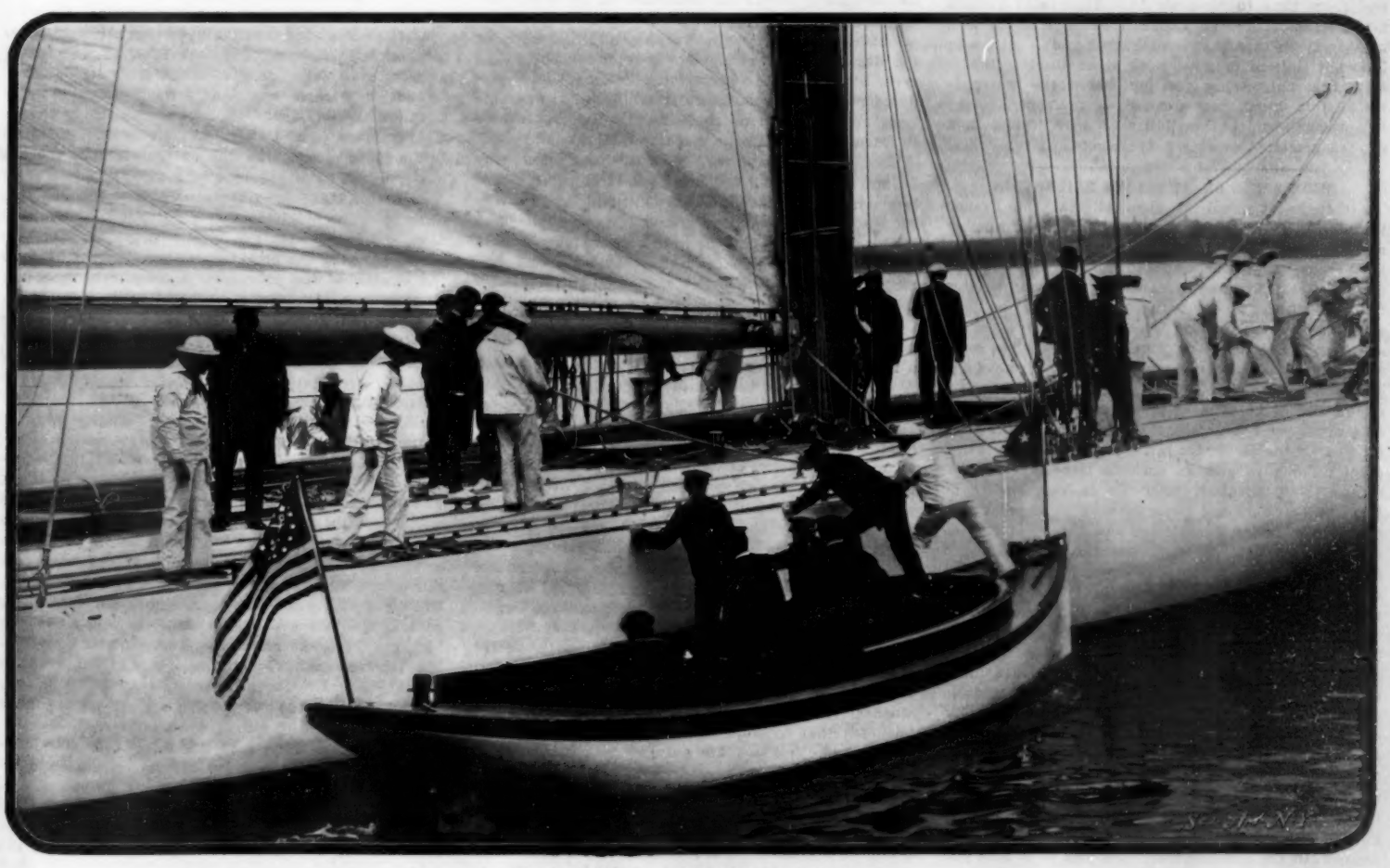


"Reliance" Shows Her Enormous Sail Spread.

A Council of War.



The Committee Inspect the New Cup Defender.

TRIAL TRIP OF THE CUP DEFENDER "RELIANCE."—[See page 354.]

SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, MAY 9, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

FILTRATION PLANTS AND TYPHOID FEVER.

Once more the vital question of the filtration of city water supply as a preventive of typhoid fever has been brought forcibly to public attention by the ravages of typhoid epidemics in widely-separated districts. The most serious of these outbreaks, and the most pitiful in its results, is that which occurred recently at Ithaca, where the dreaded disease cut a wide swath among the students of Cornell University. The experience gained by those cities in America which within the past few years have installed filtration plants through which the whole of the city's drinking water is passed before it is turned into the city mains, has given the strongest kind of proof that the reports of the wonderful efficacy of such plants, which have reached us from time to time from European cities that have already made the experiment, are not in the least exaggerated. Prof. Siebert of this city, a leading authority upon the subject on both sides of the Atlantic, in a recent work upon the relation of typhoid to water filtration, gives statistics to prove that for the decade previous to the installation of filtration plants in certain of the larger European cities, the death rate from typhoid epidemics reached the high percentage of one in every 2,600 inhabitants; whereas in the six years immediately succeeding the use of filtered water in these cities, the death rate fell to 1 in every 11,000 inhabitants. The SCIENTIFIC AMERICAN always has been a most earnest advocate of the filtration system, and from time to time we have illustrated various plants that have been installed in American cities, notably those at Albany and Philadelphia. Although it is not claimed that filtration gives absolute immunity, this only being possible where the water is boiled, this dread disease can be so far controlled by this means that the possibility of an epidemic in a city so protected is extremely remote.

HIGH SPEED ON AMERICAN RAILROADS.

Although it cannot be disputed that the French railways hold the first place in respect of the number and speed of fast expresses that run over their principal lines—a distinction held up to a few years ago by Great Britain—there are some roads in this country which are running trains, that on certain stretches accomplish speeds that are equal to anything that is made on European roads. The most notable trains are those which are run from Camden to Atlantic City, where a train recently covered a distance of 59 miles in 44 minutes, which is a rate of 80½ miles per hour. These Atlantic City trains fully deserve all the credit for fast running which is given them, although it must be borne in mind that the conditions are particularly favorable to high speed, the line being straight and level, the engines of great power, and the trains, considering the weight of the engines, comparatively light. There is another service of fast express trains in this country which scarcely receives the credit that is due to it. We refer to the remarkable hourly service over the Reading route between Jersey City and Philadelphia, in which seven trains are started on the hour from each city, and make the run of 90½ miles in a couple of hours, many of the trains having to make several station stops in entering and leaving each city, when called upon to do so by signal. In a recent run from Philadelphia, in which six intermediate stops were made, we timed the mile posts by stop-watch, and found that several of the miles were run in from 45 to 48 seconds, the timing being taken at every post between mile posts 53 and 32. The average for this distance was 72 miles per hour, while the distance from mile post 46 to mile post 35 was run at the rate of a fraction over 76 miles per hour. Our readers may also remember the trip taken by the editor of this journal on the Twentieth Century Limited, when a 352-ton train was hauled from Albany to Spuyten Duyvil, 131.7 miles, in 131 minutes, one stretch of ten miles being run at the speed of exactly 75 miles an hour.

ACCELERATION TESTS ON THE GREAT EASTERN RAILWAY.

The powerful engine for suburban service on the Great Eastern Railway, England, which we illustrated in our issue of May 2, has undergone its trials successfully, and proved that it is capable of a rate of acceleration with a heavy suburban train that is altogether unprecedented for a steam locomotive. The engine was designed to start from rest with a suburban train of eighteen cars, fully loaded, weighing 350 American tons, and attain a speed of 30 miles per hour in 30 seconds, which is an acceleration of 1.46 feet per second. It will be remembered that the engine has only 3,010 square feet of heating surface for three 18½ x 24-inch high-pressure cylinders; and doubt was freely expressed as to whether this amount of heating surface would keep these cylinders supplied with steam in sufficient quantities for such a supreme effort. In the preliminary trials trouble was experienced with the priming of the boiler (a very natural result), but by modifying the steam supply to the cylinders, this trouble was remedied; and on a recent occasion, with a train of new cars weighing 377 American tons, and a new engine that had not worked down to its bearings, an acceleration of 1.40 feet per second was accomplished. It was, therefore, considered to be proved that the desired acceleration could be easily secured. The test was carried out by means of a series of evenly-spaced electrical contacts arranged alongside the rails, which were acted upon by a brush upon the engine, the time of contact being automatically registered in a cabin placed near the line. The results achieved are certainly very remarkable, and prove that the steam locomotive is certainly going to die hard before it is completely ousted by the electric motor from this class of service.

RAPID DEVELOPMENT OF THE STEAM TURBINE.

In the development of what might be called the epoch-marking inventions of the day, it is noticeable that there has been in almost every case a point at which the invention, having clearly demonstrated its commercial value, entered suddenly upon a period of rapid and widespread development. Evidently we have reached such a point in the history of the steam turbine. The story of the determination of the principles of operation of the steam turbine, and of the embodiment of those principles in a practical and commercially-useful machine, will be forever identified with the names of De Laval and Parsons, the first-named having proved the usefulness of the steam turbine for work that required a small, high-speed motor of moderate power, while Parsons met and satisfied the demand for a prime mover of lower speed and great power. Of late years other inventors have produced more or less successful machines of the turbine type, and chief among these are the Rateau turbine in Europe and the Curtis machine in this country.

Because of the wide variety of uses to which it may be put, and the unprecedented power of some of the larger machines that have been built and put into very successful operation, the Parsons turbine is the best-known machine to-day, both in this country and in Europe. It was already well established and had made its great reputation abroad, when the rights for the United States were secured by the Westinghouse Company, and with the powerful influence and prestige of this concern behind it, the Parsons turbine is having a remarkable growth both in this country and abroad. A case in point is the contract recently given to the British Westinghouse Company by the Metropolitan District Company of London, for four huge turbo-alternators. Each of these machines is designed for a normal capacity of 5,500 kilowatts, but will be capable of carrying an overload of 50 per cent, thereby giving for each unit a maximum output of 8,250 kilowatts, or say about 11,000 horse power. As proving how early in its career the steam turbine has shown its ability to compete in size of individual units with the largest reciprocating engines, we may mention that these engines will be not only the largest turbines ever made, but also the most powerful single-cylinder engines of any type whatever in the world. Indeed, very few multiple-cylinder engines in existence have greater maximum power. As showing the wonderful compactness of this type of engine, it may be noted that in spite of their enormous power, the Metropolitan turbines are only 29 feet in length by 14 feet in width and 12 feet in height, while the length over all of the turbine and alternator complete is only 51 feet, 9 inches.

If there is a drawback that can be urged against the steam turbine, speaking of it broadly, it is the extremely high speed which is necessary, if the best results in economy are to be secured. In the De Laval type the speed is so great that for almost every class of work to which it is put, some form of reducing gear is necessary; and the construction of a satisfactory gear for such work is rendered practical only by the comparatively small units in which the De Laval type is built. In the Parsons turbine, a more moderate speed of revolution is possible, but even here the speed is higher than is for many classes of work desirable; indeed, for marine propulsion the high speed of revolution has placed very arbitrary limits upon the type, size, and number of propellers that may be used. For this reason among others, great expectations are being placed upon the turbine that has been developed in this country, and is called by the name of its inventor, Mr. Curtis. This machine embodies some of the features both of the De Laval and the Parsons type. Like the former, the steam is fed to the moving blades by a series of steam nozzles, and like the Parsons type, the series of moving blades are arranged alternately with series of stationary blades, while it also embodies the compound and condensing features which have conduced so greatly to the success of the Parsons machine. An element that is greatly in its favor is the fact that the axis of the machine is arranged vertically, the turbine and its alternator, in turbo-electric plants, being arranged one above the other on a common vertical shaft. This results in considerable economy of engine foundation and floor space, and will prove to be a distinct feature in favor of this type in city power plants and in installations where floor space is limited and costly. Like the Parsons, the Curtis turbine has been taken in hand by a large electric manufacturing company in this country, the introduction and development of it being carried on by the General Electric Company at Schenectady. Already several large orders for this type are being executed.

The indications are that the steam turbine in its various forms will, before long, be in practically exclusive occupation of the electric lighting and electric power plant field. Regarding the range of its application in the merchant marine, it is less easy to prophesy. It seems to have proved its value as a motor for the propulsion of yachts, torpedo boats, and the smaller class of passenger steamships. Whether it will give equally good results in the slow freight steamer and the large, high-powered, fast-steaming Atlantic liner, and in big battleships and cruisers, has yet to be proved. The immediate obstacle to overcome is that of reversing, which at present can only be done under limited power; but outside of this difficulty, we are aware of no fact developed in the course of the extensive trials of the steam turbine in the propulsion of ships which indicates that it will not give as good, and probably better results, in the larger as it has in the smaller class of vessels.

NEW ELECTRICAL DISCOVERIES.

After maintaining that the numerous attempts made to show the existence of a back E. M. F. in electric arcs have all failed to give reliable results, W. Mitkiewicz, in a paper read before the Russian Physico-Chemical Society, goes on to examine more closely what happens immediately after breaking the circuit. In Blondel's experiments the current feeding the arc was broken periodically by means of a special rotating commutator. As the main circuit was broken, this commutator would immediately connect the circuit of a galvanometer with the electrodes of the arc, the time separating the breaking of the main circuit from the closing of the galvanometer circuit being about 1-600 second. As Blondel observed no back E. M. F. at all, the author tested the phenomena occurring during the interval of 1-600 second elapsing between the breaking of the circuit and the moment of observation, by investigating the curve of P. D. between the electrodes of an arc fed by an intermittent current of constant direction. This curve was found to be quite similar to that representing the E. M. F. at the terminals of a non-inductive resistance inserted in the circuit. As, however, no absolutely instantaneous break was obtained, the interval being about 0.0001 second, the author considers that his negative results afford no evidence of the non-existence of a back E. M. F. In accordance with Duddell's views, it is suggested that this force might be the difference of two thermic E. M. F.'s produced at the contacts of the incandescent gaseous medium with the ends of the electrodes, the higher E. M. F. corresponding to the hotter electrode. It is inferred that the slight difference of temperatures is compensated in an interval less than 0.0001 second, the E. M. F. of the thermo-element *carbon-gas-carbon* thus falling down to zero.

At a recent meeting of the German Physical Society, Mr. L. Zehnder read an interesting note on what may be termed "reversible luminous effects." A distinct image of an object placed in the way of cathode rays being produced on a photographic plate, let ordinary light be allowed to act on the latter; the points previously acted on by cathode rays will, after development, appear more brightly than the surrounding portions of the plate, which recalls the so-called solarization phenomena. Cathode rays will

thus exert an effect opposed to the action of visible light, the points acted upon by the former becoming less sensible to subsequent exposure of luminous rays. These differences are clearly shown, when exposing celloidine paper to the action of either kind of rays; cathode rays, in fact, are found to produce a brown color, whereas a violet tint is observed in the case of ordinary light. If a strong brown color is produced on celloidine paper exposed to cathode rays, this colorization wil gradually vanish, on subsequent action of light. Similar effects to those of cathode rays are observed when heating the paper before exposure to light, when the points colored by the influence of heat will become insensible to any action of luminous rays. The heating produced by cathode rays cannot, however, be alone responsible for the above phenomena, as the tint produced by heat will never pass away on being next exposed to light.

The author thus succeeds in reversing negative images into positives. By prolonged exposure, these images may be made wholly to disappear.

Becquerel rays will act in a manner quite analogous to that of luminous rays; canal rays behave in a way similar to cathode rays, as well as ultra-violet light. These phenomena are likely to afford a new means of investigating and analyzing these rays, which possibly might serve to elucidate their nature.

ABSTRACTS OF PAPERS PRESENTED AT THE NATIONAL ACADEMY OF SCIENCES.

BY MARCUS BENJAMIN, PH.D.

The annual stated session of the National Academy of Sciences was held in Washington from April 21 to 23, 1903, under the presidency of Dr. Alexander Agassiz.

At that session, which is the business session, the Academy devoted its time chiefly to the consideration of the award of medals, the reports of committees, appointment of new committees, the election of officers, and election of members.

The Draper medal which is awarded biennially for astronomical advances, was given to Prof. George E. Hale, of the Yerkes Observatory, Williams Bay, Wis., for his recent researches on solar and stellar spectroscopy. Dr. Hale is one of the youngest members of the Academy, but he has already achieved a high reputation for his brilliant researches in the domain of celestial physics.

At the request of Secretary Hay, of the Department of State, the Academy appointed a committee, consisting of Prof. Chandler, of Columbia University, Dr. Billings, of the New York Public Library, and Dr. Remsen, of Johns Hopkins University, to consider a method by means of which the original copy of the Declaration of Independence might be preserved. It will be recollected that in the early history of the Academy a similar committee was called upon to propose a method of restoring the ink, which had become faded. At that time it was suggested that an application of a solution of potassium ferrocyanide, if washed over the parchment, would produce a precipitate of prussian blue, and so preserve the written text of that precious document, but no action was taken. The parchment is now, however, showing signs of age, and it is very essential that some satisfactory means should be adopted to prevent its entire disintegration.

The papers, which were brief summaries of progress, and for the most part highly technical, were comparatively few in number.

The first presented before the Academy was by James M. Crafts, of the Massachusetts Institute of Technology, on The Law of Catalysis in Concentrated Solutions. It dealt chiefly with his experiments on the sulphonic acids, on which he has been experimenting for the last few years. George E. Hale, under the title of The Rumford Spectroheliograph of the Yerkes Observatory, described in detail the spectroheliograph recently constructed at the Yerkes Observatory for photographing the sun in monochromatic light, in conjunction with the forty-inch telescope. Photographs which have been taken with the spectroheliograph show a finely mottled structure covering the entire surface of the sun. In certain parts of the sun, and especially in the neighborhood of sun spots, there are extensive regions of very bright calcium vapor. The photographs taken with this instrument include those which represent the denser calcium vapor at low levels in the solar atmosphere, and others showing the less dense vapor at higher levels. A series of slides showing these photographs were thrown upon the screen. Prof. Lewis Boss, of the Dudley Observatory, Albany, contributed a valuable paper entitled The Determination of Standard Right-ascensions Free from the Personal Equation for Star-magnitude, in which, after referring to the fact that the personal equation of an astronomer's vision was of less moment than the differing degrees of brightness of the light in which the star was observed, showed a series of observations, from which he obtained as a factor 0.0077 of a second as the average constant error found.

A paper of special interest was Radio-activity of Thorium Minerals, by George F. Barker. At the outset he gave a summary of the development of radio-activity, beginning with the work of Becquerel in 1896, after which he described the discovery of polonium by Madame Curie, and the subsequent discovery of the elements radium and actinium. The four principal sources of radio-activity are the new elements mentioned, together with thorium. The investigations in Europe had led to the presumption that thorium was only radio-active when found in connection with uranium. This, he demonstrated from his own experiments, was incorrect, and that all thorium minerals were more or less radio-active. In this country the minerals samarskite and monazite, both from North Carolina, are the principal sources for thorium. His researches further showed a definite relation between the atomic weight and proportion of radio-activity in these substances, the heaviest being the most radio-active. He showed impressions of thorium and uranium taken through sheets of brass, copper, lead, silver, and other metals. Another paper, by Prof. J. M. Crafts, was The Standardization of Thermometric Measurements, in which he argued in favor of further investigation of these measurements. His own experiments, made with different varieties of glass, convinced him of the superiority of Jena glass. The subject was one, he contended, which should be taken up by a bureau of standards, and he recommended that Regnault's experiments should be revised with modern facilities. Water, mercury, naphthalene, and benzol-phenol, he contended, were excellent solutions to work with. Dr. S. Weir Mitchell, whose experiments on the venom of snakes are famous, announced, under the title of The Discovery of an Antidote for Rattlesnake Poison, that a serum had recently been prepared in Philadelphia, which, when given to animals that had been inoculated with rattlesnake poison, seemed to counteract the effect of that venom.

Prof. Bell read a paper on his kite experiments, an abstract of which was published last week.

A biographical memoir of Matthew Carey Lea, the distinguished chemist, who was an accepted authority on the actinic values of silver, was read by Prof. G. F. Barker, and Dr. Theodore Gill presented a memoir of Dr. John E. Holbrook, of South Carolina, whose researches on herpetology and ichthyology made him famous.

Owing to the absence of Prof. Henry F. Osborn, the following papers by him, An Estimate of the Weight of the Skeleton in the Sauropoda, or in the Sauropodous Dinosaurs; New Characters of the Skulls of Carnivorous and Herbivorous Dinosaurs; and Models Illustrating the Evolution of the Amblypoda, also of the Dinosaur *Diplodocus*, together with a Theory as to the Habits of the Sauropoda, were read by title only. Also, The Diffusion of Vapor into Nucleated Air, by Carl Barus, and The Nomenclature of the Topography of the Bottom of the Oceans, by Alexander Agassiz, as well as Biographical Memoir of Clarence King, by S. F. Emmons, Biographical Memoir of A. A. Gould, by Jeffries Wyman, Biographical Memoir of James E. Keeler, by Charles S. Hastings, and Biographical Memoir of Theodore Lyman, by H. P. Bowditch, were presented by title only.

In addition to the foregoing, two papers were presented by non-members of the Academy. The first of these, On the Semi-diurnal Tide of the Northern Part of the Indian Ocean, by R. A. Harris, who was introduced by Dr. Cleveland Abbé, was accompanied by a chart of cotidal lines, and had for its purpose the showing of the times of the tide over the northern part of the Indian Ocean. There is no difficulty in drawing lines, chiefly arbitrary, however, to harmonize with all reliable observations, because the latter have been confined to shores and islands. But in the chart presented before the Academy, Mr. Harris had not only as his purpose the demonstration of the agreement with the observations, but also consistency with reasonable hypotheses respecting the origin and nature of the tide. In brief, the tides are ascribed primarily to seiche-like oscillations sustained by the disturbing forces of the moon and sun, the free period of the body approximately agreeing with the period of the forces. A binodal area extends from northwestern Australia to Somali and Arabia, and a uninodal area from Mozambique Channel to Baluchistan and India; the tides in the latter area are, however, influenced by the tides south of the channel. The co-tidal lines are generally crowded together near the nodal lines, through straits, and in shallow arms of the sea, while they are generally spread apart at and near the loops of the oscillations. Similarly, the tides in the Red Sea and Persian Gulf were also shown. A second was on The Melting Point of a Simple Glass, by Arthur L. Day, who was introduced by G. F. Becker, and consisted of an exhaustive study of the phenomena attending the change of state of anhydrous tetraborate of soda (borax), from the vitreous solid, borax glass, to the viscous liquid form, and its solidification again. Dr. Day found that when undisturbed this change was practically continuous, and that no melting point or solidifying point in the ordinary sense, existed. A little disturbance at any temperature between 490 deg. C. and 740 deg. C. was sufficient to produce a stable anhydrous crystalline form (hitherto unknown), with a constant and characteristic melting point at 742 deg. C. Another important result of the investigation is expressed by the author as follows: "That the temperature to which a liquid rises after undercooling, is not necessarily constant or in any way related to the melting point, and therefore is not entitled to be regarded as a physical constant."

The Academy adjourned on Thursday, April 23, and the scientific session, which is held in the autumn, will be convened in Chicago on November 17.

SCIENCE NOTES.

The Geographical Society of Paris has conferred the La Roquette gold medal on Capt. Sverdrup, the Arctic explorer, for his explorations in 1898 and 1902.

A French professor, M. Gadot, proposes to make the barometric column a standard of length. The pressure of the atmosphere will sustain a column of water 10.33 meters high, or a column of quicksilver of 0.76 meter. A long series of observations of the barometer at a given place at known temperatures and at the level of the sea would give a height that could be taken as a "natural" standard. M. Gadot assumes as his unit one-tenth of the height of a barometric column of water, which is nearly a meter, and upon this unit he has constructed a system of weights and measures not without ingenuity.

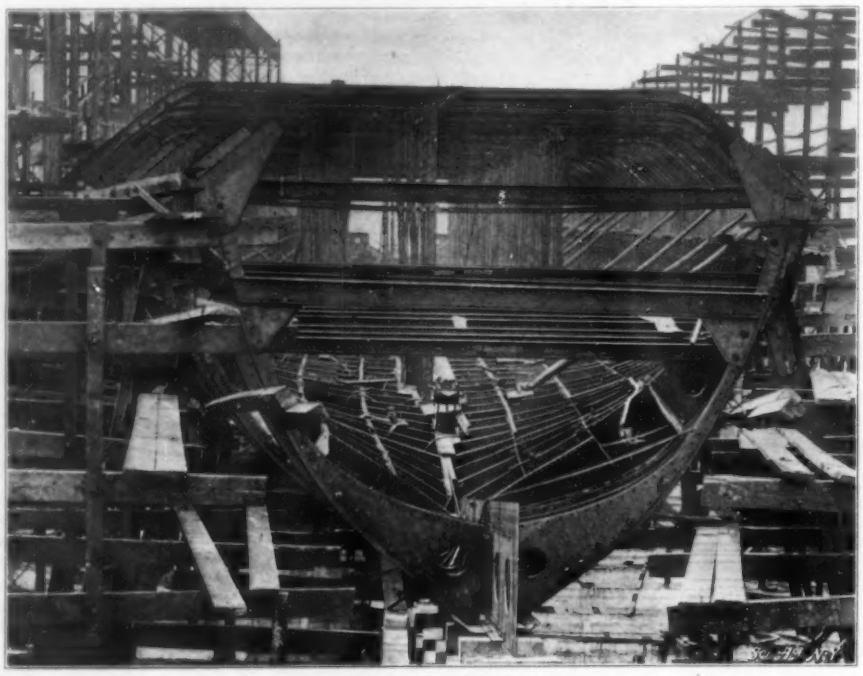
Two French officers, Capt. Truffert and Naval Ensign L'Huard, have completed an exhaustive exploration of Lake Chad and its numerous islands, hitherto very imperfectly known. According to these two explorers, the lake is 185 miles in length by 89 miles in width. Curiously enough, it is on the whole extremely shallow, the deepest part being the western side, where the water is 25 feet in depth, while on the eastern shores it is only 5 feet in depth. The lake is interspersed with eighty islands divided into three groups—the first, void of vegetation; the second, covered only with grass and herbs, but used by the natives for pasturing cattle; and the third, inhabited islands, which are thickly and well forested, and contain extensive millet plantations. Altogether, some 50,000 people dwell on these islands. One of the most notable achievements of this expedition was the discovery of a hitherto unknown tree, the wood of which is lighter than cork. The explorers found navigation in small boats hazardous, since the water becomes agitated when the wind blows from certain quarters.

The London Zoological Gardens have secured an excellent specimen of the exceedingly rare black-crested monkey (*Semnopithecus melanolophus*) first described by Sir Stamford Raffles in 1821 in the Transactions of the London Linnean Society. This species, the "Simpai" of the Malays, is confined to the island of Sumatra. The color of the fur of this monkey is chestnut red, darker on the outside of the limbs than elsewhere. The under surface is whitish; the palms and soles are black. The long, slender fingers seem all the longer by contrast with the tiny thumb. The face is bluish black; a dark line runs from the eyes to the ears. The crest is prominent. On the tail is an orange tinge. The tail is nearly twice as long as the body, and shows indistinct traces of barring near the root. This kind of marking is rare in monkeys, though there is a striking example of it in the ring-tailed lemur (*Lemur catta*), the only one in which the tail is not uniformly colored. This specimen of the black-crested monkey is housed with a hoolock gibbon, and thus affords an opportunity of comparing the different modes of progression in the two animals. The black-crested monkey leaps, while the gibbon swings and lets go, the impetus thus obtained enabling it to cover a wider space.

Some interesting discoveries of the pre-Romanic era have been made by the various parties of explorers working in different parts of Italy for archæological treasures. One party was stationed at Ancona, where the site of a burying ground which evidently belonged to the pre-Roman era was discovered. A female and male skeleton were disinterred, together with three bronze buckles, an amber necklace, some bronze chains, and a bronze waistbelt with pendants, a heavy bronze spear, sword, and iron dagger, and a large drinking cup. A third skeleton, also of a man, was found with a sword, dagger, knife, some small rings, probably belonging to a waistband, and some buckles lying near him. In Rome under the Quirinal, where the workmen are boring a large subway, several beautiful pieces of carved marble, two fine marble tablets, adorned with bas-reliefs, representing tragic and comic plays and bacchic dances, and several tablets bearing votive inscriptions to the gods have been unearthed. In the neighborhood of Segni the finest discovery was made by a workman of a tall bronze statue of a young man, his arms hanging down by his sides, and his hair parted in the middle and flowing down over the shoulders. There is little doubt that this work is a piece of original Etruscan art.

RAPID CONSTRUCTION OF THE BATTLESHIP "LOUISIANA."

When the last Congress passed a law recognizing the principle that part of the warships of the United States navy should be constructed at the government yards, the SCIENTIFIC AMERICAN was doubly pleased with the result; in the first place because we believed that the measure would prove to be of the very greatest value to the interests of the navy at large; and in the second, because it was a recognition by Congress of a principle for which this journal, for many years past, had earnestly pleaded. In advocating this measure we took the ground that a great deal of the delay in the construction of warships was due to the fact that there was no competition to act as a spur to the few private firms that were equal to the task of building battleships and cruisers; and we urged that if the United States followed the practice so successfully initiated by foreign governments, of building a certain proportion of naval vessels in private yards, a spirit of rivalry would be provoked which would undoubtedly accelerate the speed of construction in these yards. The last Congress, in making appropriations for the two great battleships of 16,000 tons displacement, decided that one of these ships should be built in a private yard and one at a government navy yard. The "Louisiana" was awarded to the Newport News Shipbuilding Company, while the task of building the "Connecticut" was intrusted to the New York navy yard, at Brooklyn.



SPEED IN BUILDING WARSHIPS.

Photograph of the 16,000-Ton Battleship "Louisiana," Showing Her Advanced Condition on April 1st—Six Months After the Signing of the Contract.

We present a photograph of the "Louisiana" taken on the first of April, which shows the advanced condition of this vessel on that date, when she was about one month ahead of the contract time of forty-two months. This contract was let on October 15, 1902, and had her construction proceeded at the rate which has marked some of the battleships of our navy yard, there would have been practically nothing to show on the ways at the date of this photograph. Indeed, the contractors themselves admit that the vessel is already about six months ahead of the ordinary rate of progress under normal conditions. Although this satisfactory showing is to be attributed largely to the natural spirit of rivalry provoked by the placing of a sister ship at the navy yard—a new departure which was bitterly opposed by all the shipbuilding interests that have been accustomed to undertake naval contracts—there is no question that much of the credit for the rapidity of construction is due to the fact that the Bureau of Construction and Repair have been granted sufficient time for working out the designs of these two ships, not merely in general outline, but also to the fullest details, and that they have been enabled to draw up most exhaustive specifications, drawings, and standing instructions to the superintending constructors. In a recent issue we commented editorially upon the report of the Chief Constructor of the Navy on the subject of the great delay in the completion of warships, in which it was shown that this delay might be largely attributed to the incompleteness of plans, which were prepared in great haste with a view to starting contracts for vessels as soon as possible after their authorization by Congress. A further cause of delay was the changes in the disposition of armor and armament, or in the details of designs after awarding the contract—changes which were the inevitable result of the haste with which the preliminary plans, upon which the contracts were based, were drawn up. The specifications for building these two ships, however, are so elaborate and exhaustive that they make a printed volume of 251 pages, in which details of the ship's construction are specified with great minuteness. As a consequence, the contractors are able to make out their bills for material, and order the same, without the uncertainty and fear of possible changes which have been such a drawback upon ships already constructed.

A photograph of the sister ship "Connecticut" at the navy yard would show that her keel is laid, and a large amount of her framing and general construction material is on the ground ready for erection. While the ship would make no such showing as is seen in the accompanying photograph, it must be borne in mind that before beginning the construction of the "Connecticut," it was necessary to build huge ways, some 500 feet in length and 70 or 80 feet in width, and to erect a great steel traveler with which to handle the material in building the vessel; so that the "Connecticut" has been handicapped to this extent. After allowing for this delay, it will be found that the progress upon the navy-built ship is quite satisfactory.

"LOOPING THE LOOP" IN 1846.

The Coney Island centrifugal railway, which goes by the winning name "Looping the Loop," has found its way to Paris. Two music halls of the lively French metropolis are at present entertaining their patrons with exciting journeys on this astonishing piece of apparatus. In the effort to outdo his rival, the proprietor of one of these music halls claimed that his "*boucler la boucle*" is under the direction of the only true and genuine inventor.

This claim of originality to the invention aroused the suspicion of one of the staff of the French weekly L'Illustration. Searching through the files of his paper, he found in the issue of September 12, 1846, the picture of which we herewith publish a reproduction. J. F. Gall in La Nature has carried out a similar and more exhaustive investigation, and proved that a certain Clavières was the inventor of the centrifugal railway.

It seems that as far back as 1833 the idea had been discussed; but it was not until thirteen years later that it was finally realized by Clavières, who was then an engineer at the Parisian Hippodrome. Daguin in his excellent "Traité de Physique" gives an illustrated account of Clavières' railway. So popular did "looping the loop" become that other countries soon adopted the contrivance. According to Clavières' plan, the track, after a sharp descent, was curved into a circular loop and then extended into an upward incline. The car, in traveling on the two rails constituting the track, plunged down the first incline at a terrific speed, whirled around the loop and ascended the second incline. In those days people were more fearful than the modern New Yorkers who visit Coney Island and boldly seat themselves in the car, utterly regardless whether or not they will come out uninjured.

In order to convince people how safe his railway was, Clavières filled the car with monkeys. It was not until the safety of "looping the loop" was thus conclusively demonstrated that men and women were willing to enjoy its doubtful pleasures for two sous.

In 1846 Clavières' aerial centrifugal railway (or as he dubbed it, *chemin de fer aérien à force centrifuge*) found its way to the Frascati Gardens of Havre, Bordeaux, Lyons, and other towns. Our picture shows the "Looping the Loop" arrangement of the Frascati Gardens, Havre.

In describing this fearful and wonderful construction in 1846, Le Journal du Havre states: "At 11 o'clock this morning the aerial railway was tested. We call it an aerial railway, since its starting point is 9 meters above the ground. For a distance of 32 meters the road drops 44 centimeters per meter. At the end of the downward incline, the car enters a circle 4 meters in height, about which it is whirled at incredible speed, thereupon traveling 18 meters up an

"LOOPING THE LOOP" IN 1846. FROM A CONTEMPORARY WOODCUT.

incline of 28 centimeters per meter. It would be difficult to imagine a spectacle more curious, more interesting. The experiments were made in the presence of M. Dumon, Minister of Public Works. As he entered the Gardens, the carriage, filled with two bags containing each 30 kilogrammes of sand, shot down with frightful rapidity, and, after having encircled the spiral, came to a stop beneath the windows of the first story of the house occupied by Madame Aguado,

PACIFIC WIRELESS TELEGRAPH OFFICE.

with such precision that a bouquet of flowers would have fallen more heavily at the feet of the noble lady. M. Thiers was present at the trial. He complimented M. Clavières, the engineer, in the most flattering terms on the accuracy of his calculations, on the precision with which he had solved the problem of centrifugal force. The next day, living passengers took the place of the bags and returned sound and well after their exciting experience." History does not record the emotions of Madame Aguado, "the noble lady."

"Looping the Loop" soon went out of fashion. The public in that day was just as fickle as it is now. About 1865, however, an ambitious Barnum thought it would be a most excellent scheme to equip the Circus Napoleon with a centrifugal railway. The car, however, was derailed on the very first trip, and the Prefect of Police, who was at that time M. Boitelle, forbade further harrowing journeys. After a lapse of nearly half a century, the centrifugal railway again made its appearance, this time in America, at Coney Island. The particular form here adopted developed into the more dangerous "Looping the Loop" for bicycles. The principle still remains substantially the same as in the old days. Still another modern instance justifies Solomon's old saw.

SANTA CATALINA'S WIRELESS NEWSPAPER.

BY CHARLES F. HOLDER.

The island of Santa Catalina is a part of Los Angeles County, Southern California, lying about twenty miles off shore, parallel with the mainland. The principal settlement or town is at Avalon, on the southeast, where one of the quaintest hamlets of the coast has grown up, having a summer population of six thousand or more and a rapidly-growing one in winter. The locality has much to recommend it—an almost perfect climate the year around, and sports and pastimes which have given it a world-wide reputation.

There has been one drawback to Santa Catalina, and that was the lack of telegraphic communication. In summer there are from two to three boats daily; but in winter only one, the steamer arriving at noon. For twenty-four hours the island was virtually without communication with the mainland. To remedy this, the Banning Company, who own the island, established a pigeon route. Large flocks of these birds were trained, and telegrams or important news were sent in this manner with success, the birds taking a message from Avalon to Los Angeles, a distance of fifty-five miles, in about an hour. The pigeon houses were so arranged that when a bird arrived with a message it rang an electric alarm in the receiver's home or office, thus calling him up.

But there was an element of uncertainty in this. Sportsmen who did not know that the birds were tame shot them *en route*. Others died of over-exertion. In the main the service was satisfactory, but so many prominent men visited the island that the need of adequate means of communication became more and more urgent. Finally Gen. A. L. New, vice-president of the Pacific Wireless Telegraph Company, suggested the installment of a wireless telegraphic plant. A point was selected north of Avalon Bay on the conspicuous headland that culminates in Sugar Loaf rock and is reached by a well-built stage road. Here the mast was erected and the office built, the latter being connected with a main office on Ocean Avenue, Avalon. The instruments used, notably the receiver, were designed by Mr. Swenson.

The nearest mainland point is at San Pedro, about thirty miles distant, and from the time the office opened for business to date, about six thousand messages have been sent without a single error or a moment's delay. The plant has been subjected to some severe tests. During the last of March a terrific storm of wind and rain very nearly cut off boat communication with the island; yet the messages were sent across the channel with directness and precision.

It is interesting to note that while the London Times is experimenting with "marconigraphs," endeavoring to test the accuracy of the system, the Pacific Wireless Telegraph Company has been for several weeks in business, supplying Santa Cataline through a daily paper, the Wireless, with all its news. The Wireless is a small newspaper containing the condensed news of the day—a perfect busy man's paper. The Avalon Wireless publishes every morning the news of Santa Catalina, the latest catches of great game fishes on the Isle of Summer, as well as the telegraphic news of the world, sent across the channel during the night.

THE PACIFIC WIRELESS TELEGRAPH STATION.

DUST STORM OBSERVATIONS.

Prolonged and elaborate researches have been carried out by two eminent scientists, Profs. Hellman and Meinardus, relative to the dust-storm which swept over the coasts of Northern Africa, Sicily, Italy, Austria-Hungary, Prussia, part of Russia, Denmark, and the British Isles between March 12 and 19 of 1901, and the results are of valuable interest and importance to meteorological science. Dust storms on a large scale are rare occurrences even in Africa. The track of this storm was traced by Profs. Hellmann and Meinardus with accuracy, and its origin located. The dust originated in storms occurring on March 8, 9 and 10 in the desert of El Erg, situated in the southern part of Algeria, which carried the dust and transported it northward. It began to fall at Algiers and Tunis in a dry state on the night of the 9th. The subsequent falls gradually took place northward, first Sicily, then Italy, the Alps, Austria-Hungary, Germany, Denmark and European Russia, in the order named, receiving their share. In Sicily and Italy the dust fell without the aid of rain, but elsewhere it was only noticed during or after showers. The quantity of dust deposited on the earth gradually became less as it traveled northward, while the fineness increased as the quantity diminished. The dust was not distributed homogeneously over the land surface, but in patches and streaks, some places being entirely free from it, while in others the fall was specially dense. The unequal distribution and different values for the rate of movement of the dust cloud are explained by the variable velocity of air currents and the changing position of the barometric depression. The investigation has conclusively proved that the dust was carried by a large mass of air which moved with great velocity from Northern Africa to the north of Europe, and that this mass of air, cyclonic in character, was led on its western side by air currents from the north, and on its eastern side by southerly currents. The total amount of dust that fell to the surface on that occasion is roughly estimated to be about 1,800,000 tons, of which at least two-thirds were deposited to the south of the Alps.

All the microscopic and chemical analyses point to this dust being neither volcanic nor cosmic, but solely such as is found in the Sahara desert and other parts of Africa. It was different with the dust showers which succeeded the eruptions of Krakatoa in May and August of 1882, which were collected at various distances, the greatest being more than 1,100 miles from the seat of the disturbance. In our latter instance the dust collected was invariably of volcanic origin, and the tremendous height to which the particles were thrown, coupled with the movement of the air at that altitude, was responsible for the dust remaining suspended in the atmosphere for so long, and also for the brilliantly-colored sunsets observed nearly all over the world. Dust-falls afford a means of obtaining further knowledge of the actual movements of the air currents in the higher reaches of our atmosphere which cannot be gained by any other methods, and are therefore of great meteorological value, but it is seldom that the fall occurs over an area where such useful data can be secured as was the case with the dust-storm of March, 1901.

The Current Supplement.

The current SUPPLEMENT, No. 1427, is in every way a noteworthy number. Mr. Day Allen Willey has prepared a full account of the famous Krupp works at Essen, which account is to appear in two installments. The first installment is published in this issue. Admirable illustrations add much to the interest of the text. Radio-active substances, the nature of which is still but ill-understood, are discussed in a valuable article by the famous chemist Becquerel. Mr. Guarini concludes his exhaustive review of the development of Marconi's system of wireless telegraphy. Sisal fiber has already been discussed in the SUPPLEMENT. Additional information on the fiber is now published, together with reproductions of some striking photographs. Lieut.-Col. H. A. Yorke, an English army officer, recently visited the United States for the purpose of studying American railways for the London Board of Trade. His report is published in the SUPPLEMENT. The launch of the Argentine cruiser "Moreno" is described and illustrated. W. J. Tennant explains in a simple way, without mathematics, the principle of the planimeter. A. Gehlen presents a scholarly summary of the latest researches on the discovery of America by the Northmen.

INTERIOR OF THE SANTA CATALINA WIRELESS TELEGRAPH PLANT.

The North-Eastern Railroad of Great Britain, which decided a short time ago to adopt motor cars upon a certain section of its system, has had three types of motors already delivered to it for experimental purposes. The cars are fitted respectively with a 33 horse power Napier, a 95 horse power Wolseley, and a 100 horse power Automotor engine. There is a special interest to automobilists attached to the trials with these respective motors, since they will afford some conclusive data regarding the advantages and disadvantages of horizontal and vertical engines, as they will run under precisely similar conditions. The Napier and Automotor engines represent the vertical engine, and the Wolseley the horizontal motor type.

THE "RELIANCE" UNDER SAIL.

We present a set of views of the new cup defender "Reliance," which were taken especially for the SCIENTIFIC AMERICAN on the occasion of the first trial spin of the new yacht. The view taken from off the starboard bow serves to show the truly enormous dimensions of the sail plan, which is so great that it dwarfs the hull, although the latter is the greatest ever given to a racing 90-footer. The other views, one taken off the port quarter, the other giving a view of the deck spars and general gear amidships, are of scarcely less interest. Perhaps the best way to appreciate the size of the sail plan of "Reliance" is to show how greatly it exceeds that of the new cup challenger "Shamrock III.," whose total area of sail is about 14,500 square feet. The main boom of "Shamrock III." is stated by reliable authorities in England to be 105 feet in length, which is a little over 2 feet more than the length of the boom on "Shamrock II." The distance from the forward side of the mast to the end of the bowsprit is 78 feet, which is the same as on "Shamrock II." The height from deck to cap is about 145 feet. Now, these dimensions, great as they are, are modest beside those of the new cup defender, whose boom is 114 feet in length, whose distance from forward side of mast to end of bowsprit is over 80 feet, and whose height from deck to truck is over 150 feet. On spars of this magnitude "Reliance" will spread from 1,200 to 1,500 square feet more canvas than "Shamrock III.," and her total area of canvas will be not far short of 16,000 square feet.

One naturally asks, How can it be possible for the boat to hold up to its work, in the squalls and heavy winds for which she must be prepared in a season's racing, such an immense amount of canvas? The answer is that Herreshoff has decided to take absolutely no chances in the way of lightening up on standing gear and spars, and has made everything above deck of exceptional weight and strength. This of course, involves extra weight aloft, which would have a very detrimental effect upon the stiffness of any boat of ordinary model. "Reliance," however, is a "brute" of the most pronounced type, the term "brute" being used in its present accepted sense among yachtsmen as meaning a vessel that sacrifices fineness of form to fullness, great initial stability, and large sail-carrying power; and her designer in adopting the modified scow type and producing a boat with hard bilges, full waterline, and abnormal overhangs, provided a margin of stiffness which he was able to draw upon in putting in the heavy spars, stays, and gear necessary to carry the exaggerated spread of canvas that always goes with the "brute" type of yacht. At the same time, Herreshoff, who could not design an ugly boat if he tried, has so drawn out his hull and toned down the objectionable features of the scow-type model, that he has produced a boat of unquestionable grace and beauty.

Speaking of the exceptional strength of her gear and spars, it may here be pointed out that a boat of the full waterlines of "Reliance," especially in the larger classes, is always difficult to heel down in light breezes until she is "on her sailing lines;" that is to say, until she is availing herself of all the measurement-avoiding devices in the way of exaggerated overhangs, which render the scow-type so much faster under average conditions than a more wholesome boat. The stiffness of the yacht due to her form is always more than sufficient to enable her to carry her sail in light to moderate breezes, and consequently a little extra weight aloft is a positive benefit in getting her to heel to her sailing line in light winds. Apropos of the above, probably some of our readers will have taken note of the fact that the yacht has had an extra set of club topsail spars made, which were being constructed of exceptional weight. It might be supposed at first thought that these heavy spars were for heavy weather; as a matter of fact, we can hazard a shrewd guess that they are intended for the very lightest weather, when the heeling moment of several hundred pounds of extra dead weight at a height of 120 feet above the water would do yeoman's work in pulling the yacht down to her bearings.

While praising the beauty of the Herreshoff modeling as shown in the hull, we have to make a strong mental reservation in speaking of the Herreshoff sails, which, it must be confessed, present, with the exception of the club topsail and jib topsail, but a sorry appearance. The mainsail is evidently over-large for the spars, and the leach with its battens and full roach seems to have quarreled with the rest of the sail; while there is a pronounced reversed curve, or "nigger's heel," in the foot and leach of the jib. However, there is ample time for tuning up between now and the latter part of August, and as the new boat is to have several suits of canvas, there need be no doubt that she will come to the scratch with sails in first-class shape. Among these suits, by the way, she is to sport an English set of sails made by the celebrated Ratsey firm. Since the Englishmen claim that in their attempts to win the cup, the excellence of their Ratsey canvas has been half the battle, it is to be hoped that for the sake of the purely international character of the sport, the Ratsey sails will be kept in the sail locker, and that the American champion will wear an American suit of sails when she measures paces against "Shamrock III." If so be that we are to be beaten because the challengers can make better sails, it will certainly be the wish of all patriotic Americans that our yacht should go down to defeat clothed in the homespun article.

Electrical Notes.

A few large corporations have for years maintained laboratories and skilled specialists to test their materials, supplies and apparatus, but small buyers have not been able to afford the equipment and expense necessary. For the benefit of these small buyers the Lamp Testing Bureau has equipped at No. 14 Jay Street, New York, a general electrical and photometrical testing laboratory to test electric lamps, electricity meters, electrical instruments and apparatus, and to provide incandescent lamps accurately calibrated as secondary standards of candle-power, amperes, and watts, and Clark cells for use as standards of E. M. F.

An interesting innovation, and a reversal of the common practice of stringing electrical wires, is about to be tried in a 150-mile transmission plant of the Guanajauto Power and Electric Company, Mexico. The current will be transmitted at a voltage of 60,000, and the wires will be strung on steel towers placed 440 feet apart instead of poles at more frequent intervals. Electricians have been considering the advisability of making this change for some time, and it was stated in a recent number of Cassier's that a proposition was being considered by the projectors of another power scheme, to string the wires on poles sixty feet high and placed 1,000 feet apart. It is argued that the fewer the poles the easier and more economical it will be to take care of them.

Consul-General Guenther, of Frankfort, speaking of Mr. J. Fuchs, a wine producer of Elba—presumably the island—says: "He planted, some years ago, four fields with native grapevines, in the midst of a district infested with phylloxera, and treated two of these fields with 'air electricity.' The difference in the development of the grapes of the fields was apparent; those treated with electricity yielded better results, both in quantity and quality, and were not infected with phylloxera, while the other fields were. Mr. Fuchs has demonstrated, it is said, that electricity increases the fertility of the soil. It is not sufficient simply to conduct air electricity to the earth, but there should be a direct metallic connection of the electric conduit with the main stem of the plant. On a field of about 2½ acres, five masts are erected, the tops of which are supplied with an arrangement for accumulating atmospheric electricity. These accumulators are connected with each other by wires. Wires are laid in the soil about 1½ feet deep, forming an evenly distributed metallic net. Every accumulator is connected with this metallic net by a wire running along the mast. Short wires connect with the plants, the free ends being stuck into the stem or into the main root thereof."

A Belgian electrical engineer has just brought out an invention, of which German experts seem to think most favorably, relating to electric switches, particularly to those used for controlling electric motors. Its object is the construction of a switch in which the arm is retained magnetically upon a certain contact, or upon any contact of a series, and in which it will return to its "off" position upon the failure of the current, so acting as a minimum switch. The switch consists of the following essentials: The contact brush passes over contacts arranged round an arm of the circle, of which the spindle of the contact arm is in the center. A magnetizing coil is placed on the switch spindle, which is of iron, causing the bobbin on which it is wound to act as a bearing for the spindle. The switch arm, or part of it, and the rear flange of the bobbin are also of iron, and a pole piece projects from the switch arm, which comes into magnetic contact with the rear flange at any point or points where it is desired to retain the switch arm magnetically. The pole piece passes across the face of the magnetizing coil of any convenient width, and even to inclose the whole of the coil. For motor starting, an iron pole piece is fitted to the back flange at the "full on" position, and arranged so that the switch-arm pole piece touches the back flange only at that point, so that the switch arm can be retained only in the "full on" position. In the case of regulating switches, the arm pole piece is made of such a length as to come into contact with the back flange throughout its travel, so that it can be retained in any desired position. The bearing bobbin, with its back flange, may be constructed of cast iron, and may form part of an iron back plate for the switch, or of any material except its back flange, which must be of iron. The iron spindle should preferably be in contact with the back flange. The spring for bringing the switch arm to the "off" position, and other details of construction, are arranged as is customary in such switches.

Automobile News.

During a railway strike recently in Holland, trains were not run for 48 hours. The strikers hoped that, by stopping altogether the movement of trains, they would succeed in gaining their demands. As soon as this fact became known, the proprietors of several of Amsterdam's enterprising daily papers organized an automobile service for delivering their journals in the principal cities; and, the slowness of trains in the Netherlands being proverbial, the readers were delighted to receive their papers four and five hours sooner than was customary.

A singular accident occurred recently in Paris, wherein two persons narrowly escaped asphyxiation by the fumes exuded from the gas motor of the vehicle. The motor car was tightly closed and the driver happened to observe the two passengers lying unconscious on the floor of the vehicle. The car was stopped. When the door of the carriage was opened, the gas fumes were so overpowering that it was with difficulty that the two passengers were extricated and restored to consciousness. The peculiarity of this accident emphasizes the danger of the gas motor when employed in connection with closed carriages, unless ample precautions are taken to divert the noxious fumes into the outside air.

A muffler or silencer has been devised by an engineer named Henz, who was formerly connected with the Daimler Motor Car Company, by means of which lost heat from a petrol motor is converted into electricity. Only 18 per cent of the heat units generated in a motor are transformed into power; 17 per cent escape into the exhaust, while the remaining 65 per cent is carried away by the cooling water. It is the 17 per cent of heat units lost through the exhaust that this inventor turns to profitable account, and for the purpose of converting this waste heat into electricity he has contrived a special apparatus. The current obtained from this source the inventor claims to be of sufficient potential to be utilized as a head light to the vehicle, or to be stored away in an accumulator for use in connection with the electrical ignition.

The Electrical World and Engineer digests certain statistics which have been made public by Mr. A. Elliott Ranney on the comparative costs of operating automobiles and horse vehicles. Mr. Ranney says that the cost of a fashionable driving outfit used during the winter and spring for shopping, calling, park use, etc., is found to range from $3,030 to $6,610, as follows: Brougham, $1,200 to $2,000; victoria, $800 to $1,800; two horses, $600 to $2,000; double harness, $300 to $500; single harness, $100 to $250; stable clothing, stable tools, halters, etc., $30 to $60. Total cost, $3,030 to $6,610. The expense of maintenance for stable, feed, etc., but not including hire of coachman, would be about $100 a month. A similar motor outfit will cost from $3,800 to $7,500, as follows: Electric brougham, $2,000 to $4,000; electric victoria, $1,800 to $3,500. Total cost, $3,800 to $7,500. The monthly cost of maintenance, however, not including coachman, should not exceed $70, and in addition the electric outfit is capable of four times the daily mileage of which the best horses would be capable. In other words, a lady could have her carriage at the door every day after breakfast to convey her children to school and her husband to his office, back to the house before 10 A. M. for her to shop, back (after the mistress and coachman have lunched) for calling, receptions, and a park drive, back (after the owner's family and coachman have dined) to go to the theater, supper, and return home about 12 P. M.; and yet no exhaustion of the power, no lame horses, and an ability to repeat the performance day in and day out. The coachman, moreover, has no horses to clean or feed, no harness to wash, no necessity for going constantly to the farrier and wasting the precious time of his mistress while the horses are being shod, and no good excuse to offer why he should not always be on hand at the request of his employer. He cannot keep for himself, as his little perquisites, his monthly commissions on feed, stabling or shoeing, nor can he get his percentage on all new horses bought to replace lame or sick ones. He cannot buy sponges, soap, currycombs, brushes, etc., by the score, nor keep his employer's bank account constantly depleted with bills for new harness, new blankets, repairs, etc. In the case of a light driving outfit for park or suburban use the advantage of the motor vehicle is much greater. The horse outfit will cost from $660 to $1,630, as follows: Buggy or runabout, $250 to $400; horse, $300 to $1,000; harness, $100 to $200; whip, $5 to $10; stable clothing, halter, etc., $5 to $20; total cost, $660 to $1,630. The monthly cost of maintenance would be about $40. A steam carriage capable of covering several times the daily mileage of the horse would cost from $600 to $950, or a gasoline runabout from $650 to $1,300, and the monthly cost of maintenance should not exceed $25, giving a considerable advantage in favor of the motor vehicle, not only in operating expenses, but in initial cost as well.

Correspondence.

The Naming of Warships.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to the communication of Capt. Pickering of date of March 10, in regard to the naming of vessels of the United States navy, permit me to state the exact situation of the matter:

Congress, act May 4, 1898, provided "That hereafter all first-class battleships and monitors owned by the United States shall be named for the States." This is the provision that gave the names of States to the Arkansas class of monitors recently completed.

By the act of March 3, 1901, the President is given the power to establish the classification of the vessels of the navy, and the old classification by gun strength gave place under order of June 8, 1901, to a classification by tonnage. First-rates are men-of-war of 8,000 tons and above, thus including armored cruisers, which, until recent increases in battleship tonnage, differed only from battleships by the relative proportions of speed and armament.

The names of States in the navy list appear as follows:

Commissioned: Battleships, first class, "Alabama," "Illinois," "Indiana," "Iowa," "Kentucky," "Maine," "Massachusetts," "Oregon," "Wisconsin." Battleship, second class, "Texas." Armored cruiser, "New York." Total, 11.

Building: Battleships, "Connecticut," "Georgia," "Louisiana," "Missouri," "Nebraska," "New Jersey," "Ohio," "Rhode Island," "Virginia." Armored cruisers, "California," "Colorado," "Maryland," "Pennsylvania," "South Dakota," "Tennessee," "Washington," "West Virginia." Total, 17.

Monitors, "Arkansas," "Florida," "Nevada," "Wyoming." Total, 4.

Designations of ships authorized by last session of Congress, "Vermont," "Idaho," "Kansas," "Minnesota," "Mississippi." Total, 5.

"New Hampshire," wooden ship, useless.

"Michigan," service on Lake Erie.

Names of States not on navy list: "Delaware," "Montana," "North Carolina," "South Carolina," "North Dakota," "Utah." Total, 6.

RECAPITULATION.

Commission	11
Building	17
Monitors	4
Designations	5
Useless	1
On lake	1
Available for designation	6
	45

H. C. GAUSS.

Navy Department, Washington, D. C., April 2, 1903.

Imitating the Flight of Birds.

To the Editor of the SCIENTIFIC AMERICAN:

I have read with great interest Dr. T. B. Collins' paper describing his researches on the mechanics of a bird's flight.

It seems profitable to suggest, however, to those who may address themselves seriously to the problem of mechanical flight, that if we consider the other methods of locomotion in which man has attained a certain degree of success, we can hardly expect to solve it by attempting to imitate the mechanism of a bird's wing. It will doubtless be found that nature's flying machines, like her walking, running, and swimming machines, are far too complicated and delicately constructed for imitation with means now at our command.

It is amusing to note that, with all our boasted proficiency in mechanics and chemistry, if we consider animal life merely as machines, these machines are not only unapproachable in efficiency, but man had to take a long kindergarten course in these two branches before he recognized in these designs the application of very simple principles.

The study of the flight of birds may give valuable results in demonstrating how such flight is accomplished; and when these principles are known, we may, with our cruder materials of steel and canvas, find a way to apply them after our own rude fashion; but if the first successful flying machine has beating wings, its development will form a notable contrast to the past history of applied mechanics.

Ferguson, B. C., April 4, 1903. D. G. EATON.

The Death of Paul B. Du Chaillu.

Paul B. Du Chaillu, the American author and explorer, stricken with partial paralysis, died at midnight on April 30.

Paul Belloni Du Chaillu was the center of a fierce controversy forty and fifty years ago, when his stories of life in Central Africa, and his discovery of the gorilla, since confirmed, were denounced as gross exaggerations, if not absolute lies. He never fully overcame the effects of this defamation and vilification, and although he lived to enjoy many honors, he did not reap the full reward due to his achievements. Born in New Orleans in 1838, he was early taken to Africa by his father, who held a consular appointment in the Gaboon. In 1852 he published a series of newspaper articles about the Gaboon country which attracted much attention. In 1855 he returned to the West Coast of Africa. Unaccompanied by any white man, he traveled a distance of 8,000 miles in a practically unknown country. He killed and stuffed 2,000 birds, including many new species, and many gorillas, of which he brought the first accounts to Europe. It was his vivid and eloquent description of these huge and ferocious apes that excited incredulity. For a long time the name of Du Chaillu was supposed by many to be equivalent to that of Ananias. It is only right to add that his reports were never doubted by the friends who knew his probity and his adventurous disposition.

In 1859 he returned to New York, bringing with him a most valuable collection of natural specimens, native arms and implements, etc., many of which found their way finally to the British Museum. Two years later he published his "Exploration and Adventure in Equatorial Africa." The accuracy of many of his statements was again assailed, Prof. Gray of the British Museum being one of his bitterest critics, while Prof. Owen and Sir Roderick Murchison defended him.

After spending some time in the United States, where he was in great request as a lecturer, he paid an extended visit to Sweden, Norway, Lapland, and Finland, the fruits of which were manifested in his books, "The Land of the Midnight Sun," "Ivor the Viking," and "The Viking Age." He declared that the latter of these cost $56,000 before it was published, the information in it being the result of the excavation of many hundreds of mounds on the coast of Norway.

Here is the account which he gave of his encounter with his first gorilla:

"Suddenly an immense gorilla advanced out of the wood straight toward us, and gave vent, as he came up, to a terrible howl of rage, as much as to say, 'I am tired of being pursued and will face you.'

"It was a lone male, the kind which are always the most ferocious. This fellow made the woods resound with his roar, which is really an awful sound, resembling the rolling and muttering of distant thunder. He was about twenty yards off when we first saw him. We at once gathered together, and I was about to take aim and bring him down where he stood when my most trusted man, Malaonen, stopped me, saying, in a whisper, 'Not time yet.'

"We stood, therefore, in silence, gun in hand. The gorilla looked at us for a moment or so out of his evil gray eyes, then beat his breast with his gigantic arms—and what arms he had!—then gave another howl of defiance and advanced upon us. How horrible he looked! I shall never forget it. Again he stopped, not more than fifteen yards away. Still Malaonen said, 'Not yet.' Good gracious! what is to become of us if our guns miss fire, or if we only wound the great beast?

"Again the gorilla made an advance upon us. Now he was not twelve yards off. I could see plainly his ferocious face. It was distorted with rage; his huge teeth were ground against each other, so that we could hear the sound; the skin of the forehead was drawn forward and back rapidly, which made his hair move up and down and gave a truly devilish expression to his hideous face. Once more the most horrible monster ever created by Almighty God gave a roar which seemed to shake the woods like thunder. I could really feel the earth trembling under my feet. The gorilla, looking us in the eye and beating his breast, advanced again.

"'Don't fire too soon,' said Malaonen; 'if you don't kill him, he will kill you.'

"This time he came within eight yards of us before he stopped. I was breathing fast with excitement as I watched the huge beast. Malaonen only said 'Steady,' as the gorilla came up. . . . When he stopped Malaonen said 'Now!' And before he could utter the roar for which he was opening his mouth, three musket balls were in his body. He fell dead almost without a struggle."

Dedication of the St. Louis Fair.

Notwithstanding the inclement weather, fully 300,000 persons witnessed the dedication ceremonies of the St. Louis Fair on April 30.

President Roosevelt and his escort led the column of the military parade. He was greeted with cheers, shouts, and the waving of hats and handkerchiefs. The military display was the finest ever witnessed in a time of peace in this country, 15,000 men being in line and all branches of the service being represented.

While the parade was all that the most enthusiastic could desire to see, it was the speech-making in the Liberal Arts Building that attracted most attention.

When Cardinal Gibbons concluded the invocation, President Francis introduced Thomas H. Carter of Montana, president of the National Commission, who delivered the opening address.

After the rendering of "The Heavens Proclaiming" by a grand chorus of 1,000 trained voices, President Francis made an address in which he presented the building to the Exposition Company.

When President Francis introduced President Roosevelt the audience rose as one man and cheered and cheered again. The President said:

"This work of expansion was by far the greatest work of our people during the years that intervened between the adoption of the Constitution and the outbreak of the civil war. There were other questions of real moment and importance, and there were many which at the time seemed such to those engaged in answering them; but the greatest feat of our forefathers of those generations was the deed of the men who, with pack train or wagon train, on horseback, on foot, or by boat, pushed the frontiers ever westward.

"Never before had the world seen the kind of national expansion which gave our people all that part of the American continent lying west of the thirteen original States, the greatest landmark in which was the Louisiana Purchase. Our triumph in this process of expansion was indissolubly bound up with the success of our peculiar kind of federal government, and this success has been so complete that because of its very completeness we now sometimes fail to appreciate not only the all-importance, but the tremendous difficulty of the problem with which our nation was originally faced.

"When our forefathers joined to call into being this nation, they undertook a task for which there was but little encouraging precedent. The development of civilization from the earliest period seemed to show the truth of two propositions: In the first place, it had always proved exceedingly difficult to secure both freedom and strength in any government; and, in the second place, it had always proved well-nigh impossible for a nation to expand without either breaking up or becoming a centralized tyranny.

"We expanded by carving the wilderness into Territories, and out of these Territories building new States when once they had received as permanent settlers a sufficient number of our own people. Being a practical nation, we have never tried to force on any section of our new territory an unsuitable form of government merely because it was suitable for another section under different conditions. Of the territory covered by the Louisiana Purchase a portion was given statehood within a few years. Another portion has not been admitted to Statehood, although a century has elapsed—although doubtless it soon will be.

"Over by far the major part of the territory, however, our people spread in such numbers during the course of the nineteenth century that we were able to build up State after State, each with exactly the same complete local independence in all matters affecting purely its own domestic interests as in any of the original thirteen States—each owing the same absolute fealty to the union of all the States which each of the original thirteen States also owes—and finally each having the same proportional right to its share in shaping and directing the common policy of the Union which is possessed by any other State, whether of the original thirteen or not.

"This process now seems to us part of the natural order of things, but it was wholly unknown until our own people devised it. It seems to us a mere matter of course, a matter of elementary right and justice, that in the deliberations of the national representative bodies the representatives of a State which came into the Union but yesterday stand on a footing of exact and entire equality with those of the commonwealths whose sons once signed the Declaration of Independence. But this way of looking at the matter is purely modern, and in its origin purely American.

"This, then, is the great historic significance of the movement of continental expansion in which the Louisiana Purchase was the most striking single achievement. It stands out in marked relief even among the feats of a nation of pioneers, a nation whose people have from the beginning been picked out by a process of natural selection from among the most enterprising individuals of the nations of western Europe. The acquisition of the territory is a credit to the broad and far-sighted statesmanship of the great statesmen to whom it was immediately due, and, above all, to the aggressive and masterful character of the hardy pioneer folk to whose restless energy these statesmen gave expression and direction, whom they followed rather than led."

Ex-President Cleveland was then introduced by Senator Carter. Mr. Cleveland read his speech from manuscript.

At the conclusion of Mr. Cleveland's address "America," with full chorus and band accompaniment, was rendered. Prayer by Bishop Hendricks and benediction by the Rt. Rev. Henry C. Potter, brought the ceremonies to a close.

AN AUTOMATIC CENTRIFUGAL AMUSEMENT WAY.

The public never seems to tire of daring circus feats, and that they even enjoy direct participation in them, where this is feasible, is shown by the success which has been attained by roller coasters and "loop-the-loop" centrifugal railways. The bicycle loop is, perhaps, the most dangerous form of amusement ever devised, and the device which we illustrate is intended to mitigate some of the danger for bicycle riders inherent in loops. Heretofore loops have been constructed of helical spiral form, so that the direction taken by the car or bicycle is continually changing its plane. This makes it exceedingly difficult to ride the loop on a wheel, as it necessitates constant and very accurate steering. Mr. C. L. Hagen, the well-known stage machinist of New York city, has devised an ingenious apparatus which obviates the difficulty referred to. He provides an interrupted circle which lies in a single plane, so that the amount of steering is minimized, or almost done away with.

Means must be provided to allow for the exit of the rider. This is accomplished in the spiral loop by the lower portion of the spiral, which permits the rider to run out onto the floor or ground. With the apparatus we illustrate, the rider makes his escape by the operation of a movable trap which forms part of the interrupted circle. This trap is released automatically by the weight of the rider and wheel. Our bottom cut represents the normal position of the trap when it is ready to receive the rider, and the top left-hand cut shows the position of the trap when the rider makes his exit. When it is considered that only a second and a half elapse from the time the trap is sprung until the rider passes over it and out of the circle, it will be seen that it is necessary to provide means for very rapid adjustment of the pivoted section of the interrupted circle. The height of the incline is 45 feet. Each side of the track is painted black, and the center is left unpainted, in order to assist the rider to steer. The frame of the device is constructed of angle irons braced with adjusting rods. The interrupted circle is 26 feet in

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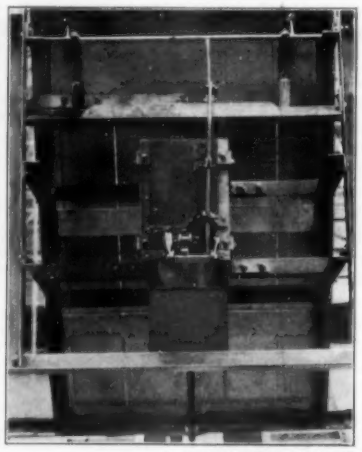
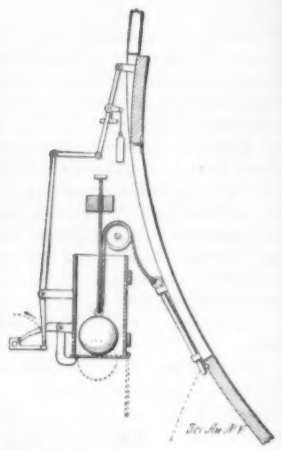
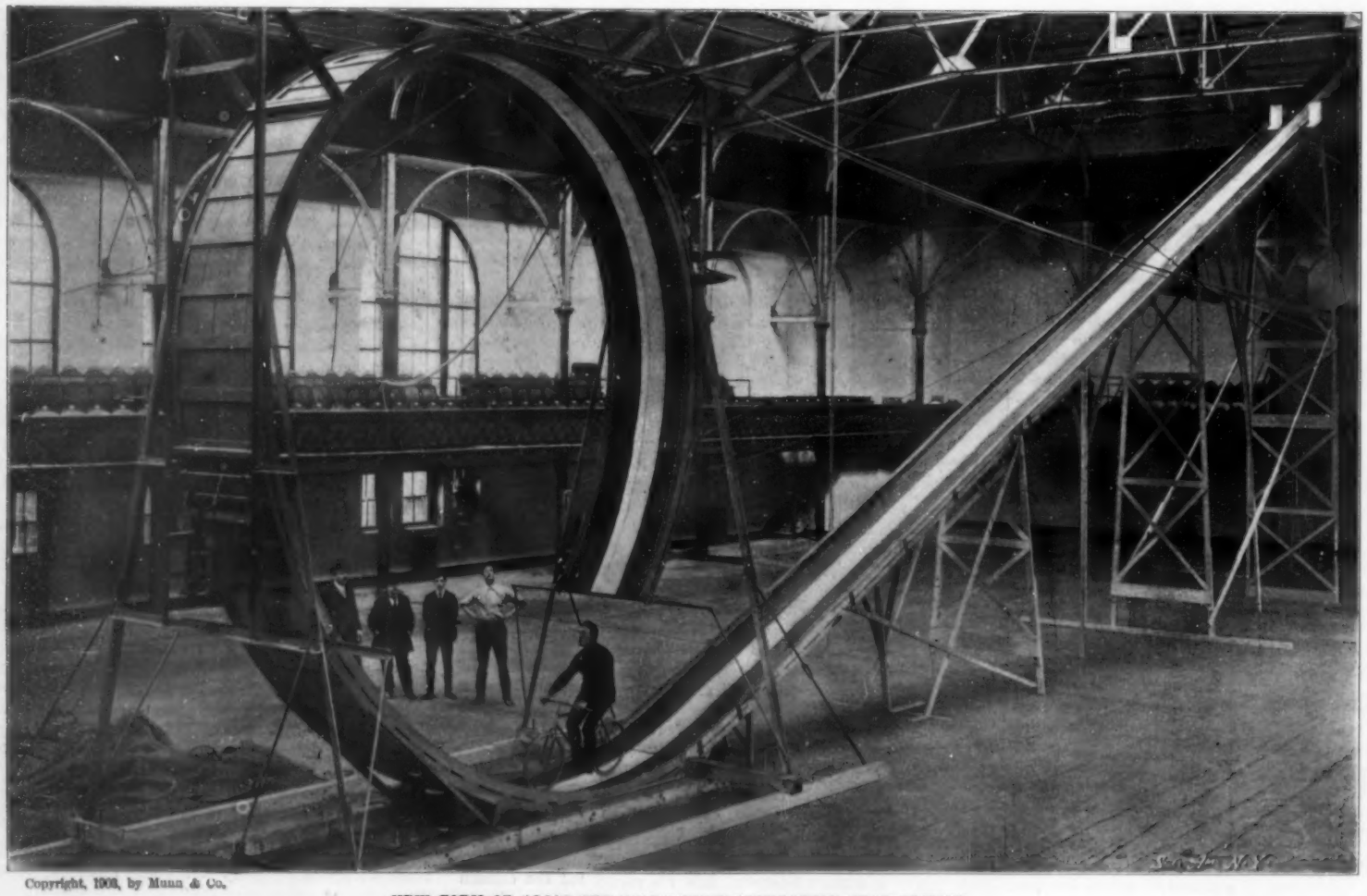
The Trap Closes.





Details of the Tripping Mechanism.

The Movable Trap.



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NEW FORM OF "LOOP THE LOOP" WITH OSCILLATING TRAP SECTION.

Yukaghi Reindeer Herders.

A Chukchee Skin Hut.

height and 20 feet in width, and the track is 4 feet wide. The movable section oscillates on a 3-inch trunnion. Springs are provided to assist its quick movement, and its upper end is heavily counter-weighted by iron bars which slide in between the girders. The releasing mechanism consists of a one-foot hinged movable section of the floor of the circle extending across the entire width of the roadway. The rider stands upon the blocks on the incline, which serve to raise the rider sufficiently, so that an attendant may place the bicycle in position to receive him. The rider then takes his seat upon the bicycle, and removes his feet from the blocks and places them in the stirrups. The bicycle is of especially heavy construction, weighing 65 pounds, and is provided with stationary hangers for the feet. The descent begins, and the momentum which is acquired from the steep incline is sufficient to cause the rider to pass around the interior of the circle, he being held to the track in traversing the circle by centrifugal force. As he passes the hinged section, it is depressed, and acting through the medium of shafts and levers, a dog releases the hinged bottom of the iron box, which serves to support a large lead ball to which is secured a wire rope which passes over a sheave and is fastened to the end of a long bolt. The instant the weight drops, a sharp pull is given to the bolt, sufficient to draw it back, releasing the trap, which falls into the second position by gravity and accelerated by the springs. It will be noticed that movable dogs are provided to run on the beams supporting the trunnion bearings. Their object is to prevent any recoil of the trap. When the rider passes out of the circle after the trap has been sprung, he directs his wheel against ropes which are stretched across the path. The ropes pass through blocks, and are secured to chains which are dragged along the floor or ground, gradually bringing the rider to a stop. The loop illustrated was assembled at the St. Nicholas Rink, New York city, where our photographs were taken. The first test was made with a 14-pound bowling ball. The trap worked quickly, and, in fact, there was a good fraction of a second to spare. The next test was made with a car, which is shown in our engraving. It was held on the track by wheels which pressed against angle irons which were secured to the girders. The car weighed 262 pounds. The next test was made by Carl Anderson, who had already ridden the spiral loop. He found that the factor of safety was ample, the trap springing into its second position just before he had reached the top of the loop. This act is very exciting, for it is almost impossible for the eye to follow the rider while he is making his circuit. Mr. Hagen is building a similar device half the size to be ridden by a monkey in a car.

A Wooden Year, Month, and Week Calendar of the Yakut Tribe.

SIBERIAN COLLECTION OF THE JESUP NORTH PACIFIC EXPEDITION.

BY WALTER L. BEASLEY.

The Jesup North Pacific Expedition, sent out under the auspices of the American Museum of Natural History, after several years of exhaustive investigation, has completed its field work. The main feature of the expedition was the remarkable ethnological specimens and discoveries obtained in Siberia by the Russian explorers and scientists, Messrs. Waldemar Jochelson and Bogoras. These distinguished investigators, with dog and reindeer sledge, traveled ten thousand miles or more over some of the wildest and most inhospitable regions of the earth. As bearing on the problem of American ethnology, this is considered one of the most noteworthy expeditions of recent times. The twenty thousand or more specimens of household utensils, dress, and ceremonial objects, whose like has never before been brought into civilization, strikingly illustrate the life habits and culture of some of the most primitive men and women dwelling on our globe to-day. The description of these objects themselves, which will appear in their forthcoming memoirs, will add a new and interesting chapter to the history and development of the human race. The exhibits will be further augmented by a series

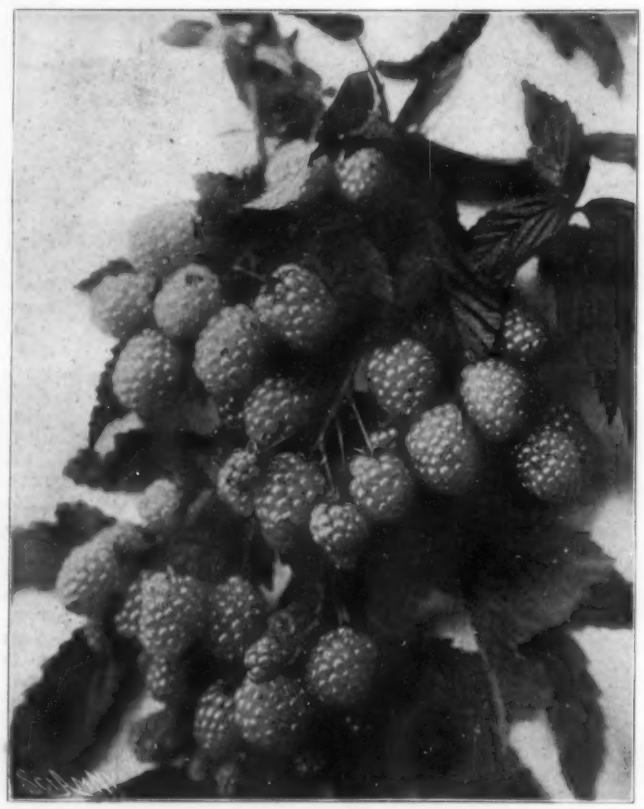
Warrior in Armor.

Cowhide Churn and Birch Ceremonial Vessel for Churning Koumiss.

A Yakut Belle.

SIBERIAN COLLECTION OF THE JESUP NORTH PACIFIC EXPEDITION.

of life-size portraits of the various race types, done in plaster from actual casts taken in the field. These will be executed by Mr. Casper Mayer, the Museum sculptor. The object of the expedition, under the general supervision and direction of Dr. Franz Boas, chief of the Department of Anthropology, was to investigate the little-known and obscure tribes of northeastern Asia, and to compare their customs with the inhabitants of the extreme northwestern part of North America. The whole territory investigated extended from the Columbia River and the entire North Pacific coast to the Amur River region in Asia. A dozen noted scientists took part in this work, which was made possible through the generosity of Morris K. Jesup, Esq. The results of the expedition, it is thought, will definitely clear up some hitherto puzzling and important problems of the relationship and history of the aborigines of Asia and America. Astonishing similarities in implements and folk-lore tales were found, which go far to justify the conclusion that they are of common origin, and in remote times were one and the same people. Messrs. Jochelson and Bogoras were especially fitted for the Siberian explorations, having made several previous trips in the interest of the Russian Academy of Sciences and the Russian Geographical Society, of which they are members. Their reports, covering the language, customs, and mythology of the Siberian races, are of the highest accepted authority, and are published by these institutions. Of the dozen or more tribes studied, the writer has space for but a general description of the Yakut and Chukchee, two of the largest and most interesting of those visited. The objects from their camps and villages form the most prominent feature of the whole collection. The Chukchee occupied most of the time of Mr. Bogoras. They number some 15,000, and are a nomadic tribe subsisting on the products of their large herds of reindeer. They possess a marvelous folk-lore, and many weird and peculiar customs, of more than ordinary interest. Mr. Jochelson made exhaustive researches among the Yakuts, who number some 270,000, and are the largest and richest of the Siberian races. They belong to the Turanian branch, who emigrated and settled centuries ago along the valley and delta of the Lena River. Their territory embraces over a million and a half square miles, about one-third of the whole area of Siberia. They are a fine race physically, and possess a good deal of skill, and are noted silversmiths. Only a few of the rich fur-traders are able to read and write. They do not cling to Mohammedanism, and while said to be nominally Christians, they practise and believe in Shamanism and magic. Fur-trading and the breeding of horses and cattle are their chief industries. Flesh is the main food eaten, and they consume an enormous amount of koumiss (fermented mare's milk), which is their favorite drink. In the preparation of koumiss a curious cowhide churn is used, adorned with brass pendants. The lifting-straps are of plaited horsehair. The funnel is carved in the shape of a horse's hoof, out of a birch-bark limb. Huge wooden ceremonial vessels and goblets, profusely ornamented with fine scroll work and brass pendants, are used to serve out the koumiss on festive occasions. The costume of a rich Yakut belle is extremely picturesque, and quite in keeping with the rigid climate, which often reaches to 70 deg. below zero Centigrade. The striking feature, however, of the garment, besides the genuine wealth of fur, is the extraordinary and lavish display of silver ornaments which adorn the front. These consist of neck and shoulder bands of solid filigree-work, three inches wide and several yards long, finely executed. The neck piece is furnished with a large center plate of silver, having long pendants, ending in a series of silver bells. The cuffs, pockets, the back and edges of the coat are also trimmed by a square linked border of silver filigree-work. The main garment is of sea-otter. The long gloves and elaborate head-dress are of black fox. The value of this rich Yakut outfit is nearly $1,000. Many of these rare and showy costumes were obtained. The extremely primitive condition of some of the isolated Yakut is vividly displayed in two wooden calendars, here pictured. These are unquestionably remarkable and startling objects to be found in use at the present day in the domain of the Great White Czar. The smaller is a month and week calendar, the larger is a year, month, and week one, and is about a foot and a half in diameter. On the outer rim are the holes representing the days of the year. The inside border contains twelve horseshoe-like curves intended for the months. Time is reckoned and kept track of by placing a peg every day in the various holes. As before stated, Shamanism is widely diffused and practised by the Yakuts. The cult is performed by both men and women. They are looked upon as supernatural, and known as the inspired and "knowing ones." They are able to work various spells, and can drive away by word of mouth or by means of objects the various evil spirits who walk invisibly along the earth, producing diseases and preying on the human soul and body. The leading and essential part of the shaman's paraphernalia, besides a fantastic costume, is a drum, which is oval-shaped and covered with reindeer skin, having inside a number of jingling bells. The women shamen have the entire back of their garments sewn with bells, amulets, and various clanging pieces of metal, which they strike and rattle during their magic incantations and performances. The drum beating is accompanied by singing. By the combination of voice and music it is thought that they are able to summon or dispel the bad spirits lurking in the body of the individual. The underlying principle, namely, that of magic and the ability of the shaman to forestall and dispel an attack of evil spirits, is practically the same among the Chukchee and Yakut. The Chukchee do not use any medicine of their own. Magic is relied upon solely. The Chukchee are divided into two groups—the Reindeer and Maritime people. The Maritime Chukchee inhabit the Arctic coast from Cape Erri to East Cape, and on the Pacific coast are intermixed with the Asiatic Eskimo. The Maritime Chukchee live entirely by hunting and fishing. The other division gain their subsistence by reindeer breeding, in which they excel all the neighboring tribes. The Chukchee are the healthiest of the tribes of northeastern Asia, and are exceedingly strong. A young man can carry a reindeer nearly a half mile upon his back. One of their surprising and most prized qualities is the ability to eat quickly. A young herdsman can strip a whole joint of reindeer flesh by simply taking hold of it with his teeth. The women have remarkable powers of enduring cold; they sew in the open air in March, when the temperature is 40 deg. below, having their fingers unprotected for hours at a time. The Chukchee carry on all calculations with the help of the fingers of both hands and the toes, and have no other method. Ten signifies belonging to two hands, and twenty a whole man, which is the limit of their adding powers. The herdsmen are never able to count their reindeer, and only know the most conspicuous animals of their herds. If there are any lost or stolen, they cannot detect it. Some of the poorer class, who do not possess herds, obtain their only subsistence by hunting the wild reindeer, which is considered the most valuable of land game. The hunting of the game is the most important event of the year. These are larger than the domesticated animals, and possess more fat, while the marrow of the wild deer, mixed with a porridge of roots and berries, is held to be the best dish in the world. The manner of hunting and killing the wild animal is unique and interesting. They inhabit the mountains and about the end of June and July, in bands of various numbers, cross the rivers. The herds every year take the same trail and cross the streams at the same place. The natives lie in ambush in canoes along the river, where they are known to cross. When the animals are about midstream, the hunters pull out and stab them with spears having a long shaft and iron point. The killing is done rapidly, and one man can slaughter as many as a hundred in a short time. The animals are carried down the stream by the current, and afterward intercepted and taken ashore by the women and children in rowboats. They are afterward skinned and hung up to dry in storehouses. Before intercourse with Russian and white traders, the Chukchee waged war upon hostile tribes and other enemies who intruded into their territory. They wore a peculiar armored costume, using the primitive bow and arrow and lance as weapons of offense. The bottom part of the suit of armor consisted of some ten rows of narrow iron plate, laced together with strips of leather, and easily folded. A thick board, in three divisions, covered with skin, formed the upper part to shield the face and shoulders. The armor was fastened to the back, leaving the hands free to use the bow or lance. This style of armor is still occasionally worn, and one rich reindeer Chukchee did not want to part with his armor, saying that he might need it some day to protect himself. The mortuary rites of the Chukchee are extremely weird and strange, one being a divination ceremony. This is performed by near relatives of the deceased, with the aid of a crooked wand or horn. The wand is tied to the thong binding the head, and the divinator, holding with his hands the opposite point, asks a question of the dead person, usually about the future success of the family in hunting, deer raising, etc. He then strives to lift the body. If the answer is in the negative, the corpse is supposed not to allow its head to be lifted. If, on the contrary, the answer is an affirmative one, the head is lifted without effort. When the spot is reached for depositing the body, the team of reindeer are slain as a sacrifice. The relatives then cut off the clothes of the dead, changing for every piece a slice of reindeer flesh, until the entire body is covered with it. The corpse is then left to the prey of the wolves. Occasionally burning the dead on a pyre is resorted to. The writer acknowledges his indebtedness to Director Bumpus of the Museum for the privilege of reproducing the accompanying photographs, and to Messrs. Jochelson and Bogoras for certain notes used from their forthcoming memoirs.



A WHITE VARIETY OF BLACKBERRY, "THE ICEBERG."

THE WHITE BLACKBERRY "ICEBERG."

A blackberry, perfectly white, named the "Iceberg," has been successfully bred by Luther Burbank, of Santa Rosa, Cal. For some time Mr. Burbank has been engaged in cultivating various grades of blackberries, obtaining by cross-breeding a grade which he calls the "Iceberg," and finds the plant is as productive and hardy as the black variety, the berries being as abundant, large, handsome, and delicious as the best black ones. The change in the color of the fruit does not affect its flavor. A field of these "Iceberg" berries is a veritable picture to the eye. Our illustration of a group of these berries shows effectively the value of the white color.

The well-known Lawton blackberry is one of the great-grandparents of this little white blackberry. The Lawton when ripe is unsurpassed, and the most productive berry on the market. Owing to its fixity of race, it will reproduce itself from seed almost exactly, and its seedlings will not be influenced, when raised from seed pollinated by other varieties, but readily imparts its good qualities when employed as the staminate parent.

The first experiment of Burbank with this blackberry resulted in the seedlings, when crossed with crystal white, being all black; the second also, though varying much in other respects; but the third produced this wonderful plant, bearing the snowiest white berries ever seen.

Very little attention was paid to the long rows of cross-bred descendants until one day this little white berry was discovered, among its black relatives, with the canes bending in various directions with its load of delicious snowy berries, which are not only perfectly white, but so transparent that the seeds, which are unusually small, may be seen in the ripe fruit.

Clusters larger than those of Lawton berries, as near as could be judged, were at least as large, earlier, sweeter, and more tender and more melting throughout, though as firm as Lawton is when ripe.

So careful are the assayers at the United States Assay Office in New York, that of the enormous amount of gold smelted each year, not an ounce escapes. In the spring the gold that has escaped in imperceptible particles with the acid fumes and smoke through the chimney is carefully gathered. Every roof in the neighborhood is swept, as well as the window sills of the adjoining buildings.

Patent Department

A CONVENIENT GAME TABLE.

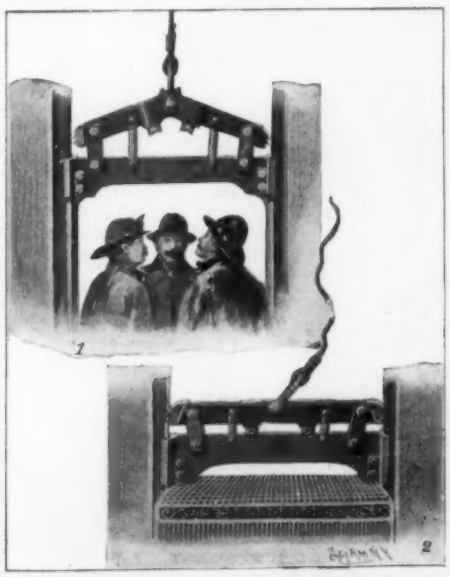
We illustrate herewith a convenient game table invented by Mr. Marten Manfred, 314 State Street, Santa Barbara, Cal. The table is arranged with a movable

CONVENIENT GAME TABLE.

top section, which when released exposes a compartment under the top surface of the table in which game apparatus may be stowed. The base of the table comprises a member *A*, from which the legs *B* project. A stem is mounted on this member, and is formed of four parallel rods *C* and *D*, all of which are rigidly attached thereto. Three of the rods are rigidly secured at their upper ends to the body *G* of the table, while the fourth rod *C* has slight play therein. The rods, it will be noticed, are tapered to receive a clamping ring *E*. Centrally spaced in the table-top *H* is a compartment *J* which forms a receptacle for the game apparatus above referred to. The movable section or game board *K* is provided with a shank *L*, which passes down through the table body and is arranged to slide between the rods *C* and *D* of the stem. A spiral spring at the bottom of the shank serves to raise the game board to the open position illustrated. A pin *F* is carried on the shank *L*, and projects between the rod *C* and one of the fixed rods. When desired to close the compartment, the game board is pressed down flush with the top of the table, and then the clamping ring *E* is pressed downward on the stem. This serves to press inward the rod *C*, which tightly pinches the pin *F*, thus holding the game board in place against the tension of the spring. The table may then be used in the usual manner; nor does it even appear externally that the table is of any more than ordinary construction. To reach the interior compartment, it is merely necessary to raise the ring *E*, whereupon the spring throws up the game board and exposes the cavity *J*.

A SAFETY CATCH FOR ELEVATORS.

A very simple device for preventing elevator accidents is provided in an invention recently patented by



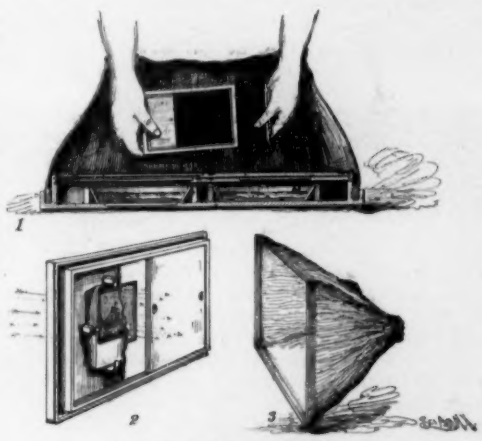
SAFETY CATCH FOR ELEVATORS.

Mr. Robinson Hainsworth, of 11 Victoria Street, Hull, England. The invention is particularly applicable to mine and lift cages, skips, and the like, though obviously it may be employed on any class of elevator, the arrangement being such that should the hoisting rope break, the safety catch will immediately operate to bring the car to a standstill. We illustrate herewith the simple device employed. It consists of a pair of toggle-levers fulcrumed to the cross beam of the car, and at their common joint connected to the hoisting rope by a pin and shackle link. The outer ends of the toggle-levers terminate in dogs or shoes which are serrated, so that when brought into operative position they will be embedded in the guides in the shaft. Normally, however, they are kept out of engagement with the guides by the tension on the hoisting rope. When in this position, as shown in Fig. 1, the toggle-levers are drawn upward and inward until limited by shoulders at their outer extremities which engage the fulcrum links. Now, should the hoisting rope break, the toggle-levers will be immediately straightened by the tension of a pair of springs, so that their serrated ends would be thrust into the guides. The weight of the car tends only to further straighten out the toggle-levers and embed the dogs into the guides, thus arresting the downward motion of the car, as illustrated in Fig. 2.

A successful trial of this safety catch was recently made in a mine in Cornwall, England. The test which aroused greatest interest was one in which the skip was filled with iron to a weight of about four tons. The hoisting rope was cut when the device was midway between the dividers. At this point there was some give to the guides, but the skip was brought to rest after sliding a distance of 3 feet 9 inches, or about 9 inches from the point of full embedment, thus demonstrating that, as claimed by the inventor, there is no shock, but a gradual arrest of the cage or skip. The inventor is at present on his way to the Transvaal to install his gear in a number of mines in that region.

DAYLIGHT DEVELOPING BOX.

A most troublesome feature of photography, particularly for amateurs, is the necessity of performing



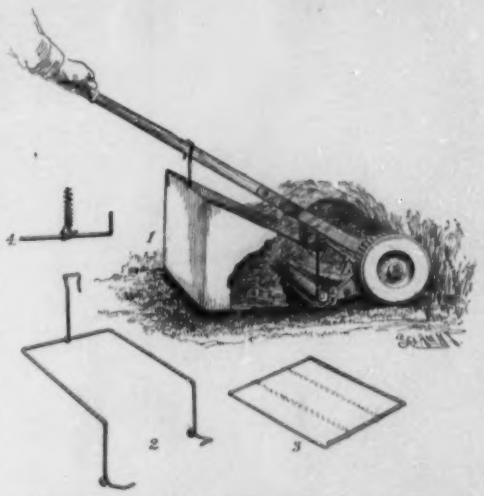
DAYLIGHT DEVELOPING BOX.

the developing operations in a dark room under a red light; for, aside from the difficulty of arranging the room so that no ray of white light may fall upon the plate, one must move with utmost caution under the dim red light to avoid upsetting and spilling the developing and fixing solutions.

We present herewith the illustration of a daylight developing box invented by Mr. Samuel J. Sloane, of 256 Ninth Street, Jersey City, N. J. This box contains two trays, one for the developing solution and the other for the fixing bath. The cover of the box comprises two lids, which are mounted to slide in grooves in the side walls of the box, so that access may be had to either tray. In the bottom of the box beneath the developing tray is a plate of ruby glass; a similar plate of glass is provided in one of the lids. When removing the plates from the plate holder and placing them in the box, a hood is used, as shown, which covers the entire box, fitting tightly into the grooves at the sides. Armholes in the hood permit access to the interior without admitting the light. After a plate has been placed in the tray containing the developing solution and covered with the lid having the glass plate, the hood may be temporarily removed. The developing operation may be watched by holding the box up to a window or lamp from time to time, permitting the light to pass through and reveal the condition of the plate. The hood is applied again when it is time to change the plate over into the fixing solution, and the lid containing the red glass is moved to cover this plate before the hood is removed. The fixing operation may then be easily observed through the glass. In order to prevent the solutions in the trays from pouring out when the device is held up to the light, a strip of glass is cemented over the lower end of each tray, forming a pocket to catch the solutions.

ODDITIES IN INVENTIONS.

USEFUL DEVICES FOR THE CARE OF THE LAWN.—We picture in the accompanying illustration a very useful attachment for lawn mowers. It consists of a receptacle which may be readily secured to any lawn mower to catch the grass as it is cut, thus preventing the lawn from becoming littered, and collecting the cut grass for feeding horses or other animals. The receptacle consists of a canvas bag stretched over a wire frame. Fig. 2 shows the upper frame, which is



ADJUSTABLE GRASS RECEPTACLE FOR LAWN MOWERS.

hooked over the handle of the lawn mower, while its lower end is secured to the mower frame. The lower frame is shown in Fig. 3, and consists of a rectangle of wire, with its ends overlapping at the lower side, where it is attached to the upper frame. A spring coiled over these ends, and secured as shown in Fig. 4, serves to draw them inward, thus holding the ends of the upper frame tightly hooked on to the mower frame. This arrangement obviously permits attachment to any width of lawn mower. Braces shown in dotted lines, Fig. 3, serve to hold up the slack of the bag when it is attached to a small or narrow machine.

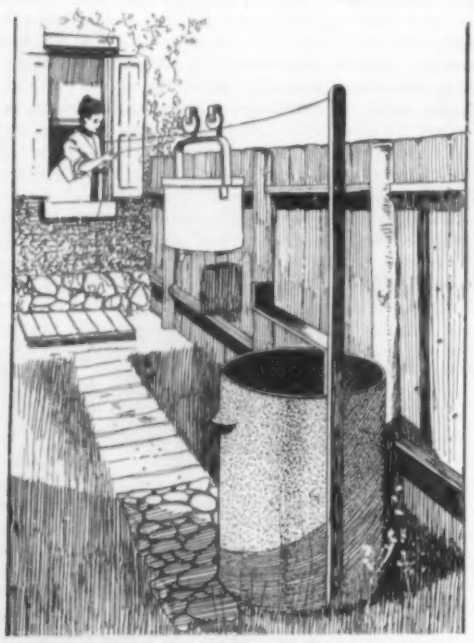
Another device which will be found useful for trimming lawns consists of a pair of shears arranged to lie parallel with the ground, but having operating levers or handles extending vertically therefrom. The blades are pivoted on a shoe, which holds them a suitable distance above the ground, and on a vertical extension of this shoe the levers are pivoted, with their lower ends projecting in slots in the blades. A cross piece on the shoe extension is provided with members for limiting movement of the levers. The device will be found particularly useful for trimming around bushes or along a fence, as illustrated. It also offers

SHEARS FOR TRIMMING LAWNS.

the advantages of being operated by a person standing in upright position, and further insures cutting the grass at a proper height above the ground.

SELF-DUMPING GARBAGE-CAN.—An up-to-date way of disposing of one's garbage is shown in the accompanying illustration. The arrangement will be found particularly useful for flats or adjacent apartments, enabling the cans to be directed from a series of points to a common receptacle, into which they will automatically deposit their contents. An overhead trolley wire is strung from the kitchen window to a post situated at any suitable point. The garbage can is suspended from a pair of trolley wheels adapted to travel

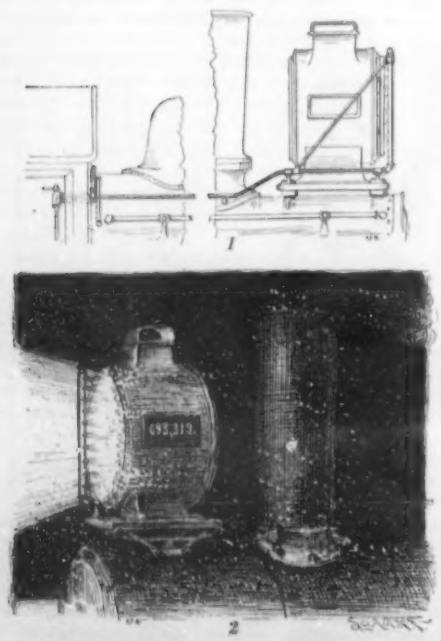
along this wire. A hinged lid which is held in closed position by means of a spring latch forms the bottom of the can. The trolley wire is preferably inclined, so that the can will travel by gravity to the dumping point. When this point is reached, the spring latch encounters a trip-piece which draws it out of engagement with the lid, permitting the same to drop. The



SELF-DUMPING GARBAGE-CAN.

contents of the can are thus deposited into a suitable receptacle. The trip-piece is hinged so as to permit the latch to pass when the can is drawn back for refilling. On stormy days and in extremely cold weather this invention will be found particularly useful, because the operator does not need to expose himself to the elements when disposing of his garbage.

Locomotive Headlight Cleaner.—When running rapidly through a heavy snowstorm, the headlight of a locomotive is often so completely covered with snow as to seriously obscure its light. Similarly, the flying snowflakes lodge upon the front cab windows, shutting off the engineer's outlook. It is unnecessary to dwell upon the dangers of such an emergency, for they are apparent to all. However, a recent invention provides a simple method for cleaning the headlight and cab windows of the locomotive, and we illustrate herewith the appliance used. It consists, briefly stated, of spray-tubes located at the sides of the window and the headlight, and suitably connected to a steam supply pipe



LOCOMOTIVE HEADLIGHT CLEANER.

in the cab. A valve on this pipe may be operated by the engineer to supply steam to the spray pipes, which are so placed as to direct a steam spray against the snow-covered glass panes. The snow is thus cleared off by the heat and the high pressure of the steam.

The total number of patents granted during the year 1902 was 27,775. One hundred and nine of these covered improvements on the Nernst lamp.

Brief Notes Concerning Patents.

Prince Augustin Iturbide, who was the heir of two emperors of the Mexican throne before that country became a republic, has developed into a promising inventor. He lives at Rosedale near Georgetown, where he maintains quite an imposing workshop. He has recently devised and patented an important improvement to the ordinary microscope, by which the power and field of the instrument are greatly increased. A small flower or insect placed in the instrument can be observed in its entirety, whereas it has been necessary heretofore to examine a part of the object at one time. The other invention, which has also been patented, is an improvement in the manner of projecting daylight into dark interiors.

It is reported that a company with a capital of one million dollars has been organized at New Orleans for the purpose of engaging in the business of purification of a number of liquids by the means of electricity. This company has secured the control of the patents of Capt. J. M. Murphy, formerly of Harrisburg, Pa., and an effort will be made to secure a contract for treating the municipal water supply of New Orleans.

The Hartman Anti-Friction Bearing Company has been recently organized at Pittsburg, Pa., for the manufacture of an improvement in the equipment of freight cars. The patent is that of an Allegheny City man, and its object is to diminish the wear and tear on the rolling stock as well as the track, and at the same time increase the capacity of the cars. This is done by the use of ball bearings on the supporting sections of the truck, which sustain the weight of the car. In rounding curves, this device is said to be particularly effective, as it permits the wheels to adjust themselves to the track, dispensing with all grinding, and therefore relieving flange wear. The manufacturers claim that the adoption of these bearings increases the carrying capacity of a car by about ten per cent.

According to the Hartford, Conn., Telegram, A. W. Cash, formerly of that city, was recently surprised by receiving a patent which had been issued after a delay of sixteen years. The invention relates to the improvement on typewriter machines, and the application was made sixteen years ago, when Mr. Cash was in the employ of the Typography Company in that city, but since that time he has moved to Newark, N. J. He had almost lost sight of the matter when he was surprised to receive the patent papers.

An ingenious machine for separating dust from grain has been placed on the market by a firm of Rochdale, Lancashire, England. It is simple in design and highly efficient. It consists of a galvanized iron cylinder provided with a spiral coil at the bottom, the spiral being of sheet metal, two or three inches wide, placed on end, and so arranged that the dust, as it is deposited, gradually creeps along until it is discharged down a central opening in the bottom of the collector. Air is forced into the room containing the grain, where it picks up all the dust, and is then directed by a duct leading to the machine, and is delivered into it tangentially, striking the casing with a high velocity on entering it, the dust being separated and collecting at the sides, until, losing all momentum, it descends to the bottom. A gyratory motion of the air is set up in the collector on account of its entering tangentially, so that the dust falling to the floor of the apparatus is forced round till it reaches the opening, which is connected to a chute where it is collected.

Prof. Elmer Gates, of Washington, D. C., has recently invented an electrical machine for the extraction of gold from the sands of the desert. The plant is mounted on a four-wheeled truck, and besides a dynamo and the means of driving it, includes a system of buckets mounted on chains, and with these the sand is scooped up as the outfit travels along and dumped, the stream being made to pass through a magnetic field, thereby inducing a static charge of the gold particles, which fly off and away from the sand, being attracted by a metal knob of opposite polarity. The cost of the operation of the machine is said to be very low, and Prof. Gates says that he has proven that it is entirely practical. As to the richness of the desert sand in the yellow metal, it it said that 216 samples taken at different points from an eighty-mile stretch of desert, yielded never less than twelve cents per ton, and sometimes as high as eighteen cents. At this rate he claims that the gold can be secured at a great profit.

Thomas Costello, an inmate of the Licking County jail in Ohio, has invented and made a stove during his term of confinement which is said to have many advantages over those of the old type, principally that it requires a very small amount of coal to do a great deal of work. Outwardly, the stove looks like any other stove, but the interior is supplied with two fire-boxes instead of one. The fire is made in the lower one, and the upper one is filled with coal. As the fire burns below, the coal above cokes, and the gas emitted during this action is carried down and is consumed in the flames. When more fuel is demanded by the fire, the coke is allowed to fall down into the lower fire-box. A stove has been built on these lines, and has been in use in the institution, and the attendants vouch for the economy of the device.

A new and novel system of train lighting is just being introduced, after having been subjected to successful tests, which resembles the axle system, inasmuch as the power for driving the dynamo is derived from the motion of the train as it passes along over the rails. In this case the necessary power is supplied by means of a rotary fan mounted on the head of the engine. The motion of the train alone is said to be sufficient to generate current enough to light the train. It is not at all dependent on any gale of wind, but merely that made by the train's movement, and the mechanism does not add anything to the ordinary resistance of the train. It does not obstruct the view of the engineer or offer any other objectionable features.

The Buffalo, Rochester & Pittsburg Railroad is about to be fitted out with the telegraphone, which instrument has already been referred to in these columns. This system permits of the use of the telegraph wire strung along a railroad line to be used also for telephone purposes. Instruments will be installed in the cabs of many of the locomotives, in baggage cars and cabooses, and in case of an accident of any character, the train can be placed in communication with the nearest telegraph station within a moment's time.

An effort will be made to secure an appropriation from the West Virginia Legislature for the purpose of erecting a monument to the memory of James Rumsey, who, it is claimed, was recognized by George Washington as the inventor of the steamboat. The proposed memorial will be erected on a high cliff of the Potomac River at Shepherdstown, overlooking the spot where it is alleged that the first application of steam to the purpose of marine propulsion was made.

M. Ducretet, a well-known French engineer, is exploiting a loud-speaking telephone, the invention of Lieut. Gaillard, of the French navy, which has some novel features. The receiver and transmitter are mounted together for the sake of economy of space, and are rigidly placed on a wall or some convenient point in the room. It is said that one speaking into the receiver in an ordinary tone can be easily heard at the other end of the line by persons located fifteen or twenty feet from the apparatus. The device is particularly intended for use on shipboard, or to connect the office of a factory with a noisy shop. There is no bell, for this is said to be unnecessary. A person desiring to speak to another simply walks up to the 'phone, and calls the one he wants to converse with. This is entirely sufficient.

A safety dress designed for the use of electricians and others working around high tension apparatus, has been invented by Prof. Artemieff, and it was recently given a successful trial at the laboratory of the Siemens & Halske Company. The dress, says Engineering, consists of a covering of closely-woven and very fine wire inclosing completely every part of the wearer. It weighs 3.3 pounds, but its cooling surface is so great that a current of 200 amperes can be passed through it for some seconds without perceptible heating effect. Standing on the ground uninsulated, Prof. Artemieff drew sparks from the secondary terminals of a transformer which was giving a tension of 75,000 volts with a period of 50 cycles per second. The inventor concluded his experiments by short-circuiting a generator of 170 kilowatts capacity by clutching hold of the terminals, and the current passed 200 amperes. Throughout the experiments, the Professor declared that he did not feel the slightest sensation of a current passing through his body.

John H. Price, the superintendent of the Candee rubber manufactory at New Haven, Conn., has just received his sixth patent for machines used in the making of rubber shoes. His latest invention is an improvement in the manner of cutting the shapes for rubber boots, by which a great saving of material is effected; and as this waste consists largely of rubber, any saving at the present price of the commodity is a great consideration. He has estimated that the value of the reclaimed waste every day at the Candee factory will be a trifle over $500.

J. J. Pole, a well-known musician of Geneva, N. Y., has recently devised a method of making a very old musical instrument in a new way. He is the inventor of a process by which the tympanum or kettle drum may be made of wood instead of copper, thereby lessening the cost to a great extent. The new drum consists of a number of pieces of mahogany, which are bent in the desired shapes under pressure, and after being put together, the whole is finished in a lathe and the head and trimmings put on. The innovation is said to have met with the approval of musicians in this country and Europe. The inventor claims that the tone of the wooden instrument is superior to that of the metal one.

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

LAWN MOWER.—S. L. BENSON, Chicago, Ill. The inventor claims as his object the provision of a mower having no parts liable to get out of order, and that will operate to cut grass quickly and evenly without clogging the blades. As it moves forward the cams cause a rapid and short reciprocation of the cutters in opposite directions, making short and powerful strokes. As the drive comes directly on the cutting-blades, loss of power or of motion is prevented.

PLOW AND CULTIVATOR.—J. D. KELLEY, Downing, Texas. This claim is on an improvement in plows and cultivators, and the invention relates particularly to the construction of sweeps, whereby more or less soil may be applied and which may be adjusted to manipulate the soil as desired and when desired to operate as a harrow. The sweeps being removable, the same set can be used on different plows and cultivators.

Electrical Improvements.

TELEPHONE SYSTEM.—T. PAUL, Yorkton, N. W. Territories, Canada. By the adoption of certain means Mr. Paul avoids several objectionable features of other systems that greatly impede the voice-currents. Ringing up is accomplished with great ease by the operator and telephone connections are rapidly made. This increases the number of subscribers that a single operator can handle. A great commercial advantage is derived by the use of simple and well-known instruments, which provides for a ready installation.

DESK FOR X-RAY APPARATUS OR THE LIKE.—H. R. SMITH, Altoona, Penn. The reference of this invention is to a desk suitable for housing electrical apparatus having currents of high potential—such, for instance, as Ruhmkorff coils, oscillators, etc.—and which is particularly suitable for instruments used in X-ray work, as well as wireless-telegraphic instruments, etc.

Engineering Improvements.

AUTOMATIC WATER-FEED REGULATOR FOR STEAM-BOILERS.—G. WEANT, Mannington, W. Va. The improvement is well adapted for the automatic control of the feed of water into a steam-boiler, so as to maintain the water at a desired height therein, the apparatus operating with equal efficiency when feed-water is supplied to the steam-generator either by gravity from an elevated tank or under pressure from a water-main, a feed-pump, inspirator, or injector.

Hardware.

FLOOR AND HARDWOOD SCRAPER.—J. R. PRICE, Fond du Lac, Wis. The purpose is to so construct the scraper that it will preserve the fingers from injury, and can be efficiently used in corners and upon moldings without removing the handle. Another purpose of the invention is to have the scraper drawn toward the operator instead of being pushed forward in operation. In this way the power is better applied and the handler works from the finished surface, thus preventing injury thereto and readily showing whether the work is even and perfect.

HINGE.—J. GAMACHE, Van Nest, N. Y. This form of hinge may be easily applied to the frame or casing and to the blind. It may be used on any kind of blinds—that is, on "flush" blinds, in connection with blind-stops, or it may be used on blinds not equipped with blind-stops and which are hinged on top of the casings outside of the stops. A leaf spring is secured in place by the same screws which fasten one leaf member. The other member is provided with means to securely hold the blind in its open position, and to so engage the spring that there is practically no strain on it in the closed position of the blind.

MINER'S TOOL.—A. V. DES MOINEAUX, Silverplume, Col. The particular purpose in this invention is to improve on the implement patented by Mr. Des Moineaux in 1902. The present tool is provided with a powder-lance which is adapted to be held firmly against slipping in its projected or retracted positions, whereby it combines in a compact and simple form the devices required in preparing a blasting charge.

CARPENTER'S PLANE.—J. W. KIRBY, Butte, Mont. This invention relates to carpenters' planes; and it consists, more specifically stated, of new and improved roller attachments involving novel details of construction, whereby frictional contact with the board being planed is materially reduced and thereby rendering less effort necessary to shove it with the bit cutting than is required where the whole under surface of the plane is in rubbing contact with the board.

NUT-WRENCH.—H. E. ANDREW, Endicott, Wash. This tool belongs to the class employed for turning nuts and bolts, etc., particularly of a kind embodying a ratchet-wheel and pawl as operative elements. The object is to adapt the device for use as a right-hand or a left-hand wrench, and affords means for a quick change in adjustment so that it may be used in either direction for screwing up or removing nuts from bolts or studs.

AWL.—J. P. BRADY, Brooklyn, N. Y. Mr. Brady in the present improvement provides a tool especially designed for the use of shoemakers, harness-makers, and other mechanics, and arranged to contain an awl, the awl when not in use being concealable in the handle of the tool. The device is simple and furnishes a workman with a knife and an awl which may be brought into use as desired.

Heating and Lighting Apparatus.

ACETYLENE-GAS GENERATOR.—C. W. METCALF, San Diego, Cal. This generator may be classified as belonging to machines for generating gas from calcium carbid, the object being to provide one of simple construction and operating automatically to feed the carbid. When a certain amount of gas shall have passed into the gasometer, means are provided for automatically shutting off the supply of calcium carbid. As the gas passes out of the gasometer to a certain extent a valve will be operated to admit a fresh supply of calcium carbid to the generator.

OIL-BURNER.—C. W. SIEVERT, Los Angeles, Cal. The principal purpose of this improvement is to adapt an oil-burner to domestic stoves, particularly cooking-stoves; and to this end the invention comprises certain novel features of construction fitting the burner to a fire-box of a cooking-stove or range.

Mechanical Devices.

SPEED-CHANGING AND CLUTCH MECHANISM FOR MOTOR-VEHICLES.—L. RENAULT, Paris, France. Comprised in this mechanism is the combination with a motor-shaft of a high-speed gear directly driven by the shaft, a low-speed gear consisting of a series of gear-wheels caused to engage by lateral shifting movements, and means including a single rack and a spur-pinion interposable between the gear-wheels and the speed-changing wheels for producing backward travel.

SASH-STILE PLOWING AND BORING MACHINE.—A. A. LOETSCHER, Dubuque, Iowa. This machine is adapted to plow and bore the stiles used in window-sashes to attach the cords to the sashes for hanging the weights thereto. Preferably it is placed alongside of a mortising machine, so that when taking the stiles away from the mortiser, the plowing and boring may be done at the same time without extra cost or help. No exertion is needed in pushing the stiles toward the cutters. This is done by feed mechanism.

REVERSIBLE WINCH-HEAD.—J. G. DELANEY, New York, N. Y. The invention in this case relates to an improvement in devices for connecting a reversible winch-head with a non-reversible rotating member of a hoisting engine or other apparatus, so that the winch-head may be reversed in direction. The device may also be employed to drive an ordinary drum.

MILL FOR GRINDING.—J. C. WEGERIF, Rawreth Rectory, Battlesbridge, England. In this case the improvement relates to pan-and-roller mills of that kind wherein the grinding-rollers are set skewwise or with their axes non-radial to the axis of the pan and, as well as the pan, are positively driven, so as to thereby cause a tearing or disruptive action to be exerted on the particles to be ground in addition to the usual crushing action.

CONVEYOR.—J. B. PITCHFORD, Randfontein, Transvaal, South Africa. The improvement belongs to that class of devices that conveys pulp, tailings, river-sand, or the like to a place of discharge. The object is to provide, in connection with an endless conveyor or belt moving at a comparatively high rate of speed, a pump for loading the belt at the same velocity as the belt is traveling, thus resulting in equalizing the load and causing a uniform discharge.

GATE.—J. GRANGER, Springer, New Mex. This improvement refers more particularly to farm-gates, and the object is to provide a structure wherein two gates are mounted upon roller-bearings to slide to and from each other; also a mechanism adapted for attachment to the supporting-frame of the gates, so connected with the gates that, without dismounting, persons may open them upon approaching and close them after passing through, these operations being made by a simple downward pull upon one or the other end of an actuating-lever, which sets in play a train of gearing connected with the lever and the hanging gate supports.

Railway Improvements.

CAR-COUPLING.—C. E. LUCAS, McComb, Miss. The primary object in view is the provision in this case of an improved construction by which the knuckle may be adjusted to an open position for engagement by an approaching draw-head without requiring the brakeman to pass between the cars. By these means the coupling may be done automatically, and the device can be uncoupled or it can be set for such automatic coupling without danger to the brakeman.

RAILWAY-TIE.—W. C. KIRKLAND, New Orleans, La. Certain novel improvements in railway cross-ties are provided in this invention. The ties are made of a combination of concrete, expanded or woven metallic rods, wooden or equivalent resilient blocks, cement, and hollow metal cases enclosing the cement. The tie possesses great strength, resists excessive pressure and strains, is unaffected by heat, cold or the elements, is easily and quickly repaired, and obviates the use of bolts and nuts for fastening the rail.

Vehicles and Their Accessories.

SLED-KNEE.—F. O. STARK, Deer River, Minn. The object claimed in this invention is the provision of a knee which in duplicate affords a reliable connection for the cross-beam of a bob-sled or other sled or sleigh with the sled runners, so as to permit a slight rocking movement and vertical play of the beam, to facilitate the starting of a loaded sleigh, and, furthermore, to permit the play between the two bob-sleds and the vehicle body in running over road-bed undulations.

VEHICLE-WHEEL.—M. J. CLARK, Chaparal, Arizona Ter. The wheel in this invention is of that order which relates to vehicle-wheels having spring-spokes to give the desired resiliency to the wheels and the vehicle. The object is to provide a new and improved vehicle-wheel which is simple and durable in construction and arranged to insure easy and comfortable riding when traveling over rough roads.

VEHICLE-COUPLING.—D. A. DICKINSON, Quitman, Ga. The invention relates to an improvement in couplings for vehicles, and has for its object the provision of a coupling device for the front and rear running-gear of a vehicle, which is simple, consists of few parts, and is applicable to any ordinary vehicle, new or old, and one which requires no oiling of the parts.

Miscellaneous.

PURSE OR THE LIKE.—ANNIE IRONS, Attleboro, Mass. The invention provides a purse or the like made up of chains of both the soldered and unsoldered links. The chains are so arranged as to form a meshed chain fabric, made up in one direction by finished chains which are connected with each other at intervals by connecting-links.

FLY-SCREEN.—S. C. DANIEL, Gas City, Indiana. The object in view in this improvement is to furnish a screen that shall in addition to serving the usual purpose of excluding flies and other insects, also serve as a means of allowing egress of all kinds of insects that may be in a room. The screen and frame may be made any size or shape to fit any door or window.

MUSIC-SATCHEL.—R. E. TROGNITZ, San Diego, Cal. This invention has for its object the provision of a bag or satchel in which the papers or sheet-music may be placed or kept in a flat condition—that is, without rolling or folding them. It is furnished with flaps or portions which may be readily adjusted to permit sheets to be added or removed from the bag, yet retaining those therein snugly and tightly in position.

MARKING IMPLEMENT.—G. A. MCALPINE, Newport News, Va. The aim of the inventor in this little device is to provide a novel marking implement for defining circles on plate metal to indicate where perforations are to be made in the metal, and thus enable the metal sheet to be accurately punched to receive rivets or for other purposes.

SYSTEM OF SHELVING.—J. HARRISON, Lincoln, Neb. The system of shelving devised by Mr. Harrison bears more particularly on the kind used for stores, cabinets, and furniture of various sorts. In operation, the transverse supports are put in position, and the shelving is mounted upon them directly. In adjusting the relative height of a shelf, use a thicker support or a plurality of supports nested together.

MECHANICAL TOY.—J. FLAHERTY, New York, N. Y. According to this invention the body of the toy is made to represent a snake and is formed of several joined sections, so that by independently moving them the toy may be given the sinuous appearance of a moving snake. A forked tongue represents fangs. This is moved rapidly back and forward as the snake moves, so as to give the impression of a snake advancing to strike. Clockwork or other motive devices are contained in the body to propel the toy.

FRUIT-JAR.—D. G. CARPENTER, Highview, N. Y. One object of Mr. Carpenter is to furnish a closure easily and securely closed in an air-tight manner, one capable of the important advantage of being easily and quickly opened by a very slight effort, thus overcoming one of the objections to existing styles of jars. Another object is to have the closure remain attached to the vessel and capable of swinging out of the way of the cover.

CARTRIDGE-CASE.—A. BARRALLON, St. Etienne, Loire, France. This device may be classified as relating to cases for containing the projectiles in cartridges for firearms of all kinds and calibers, including mitrailleuses and cannons of small caliber. The case is made of plastic material, of which the base is preferably celluloid, in combination with inert material, such as sienna, earth or other pulverulent material.

SIPHON-FILLING APPARATUS.—L. P. SETZLER, Kansas City, Mo. This device is adapted for filling siphon-bottles from tanks containing carbonated liquids, and drawing the liquids off into receptacles. The leading objects are, first, to dispose of the "sniff"—the liquid remaining in the spout after the bottle is filled—and, second, to enable excess gases to be exhausted from the siphon-bottle during the filling thereof.

BED-SLAT.—V. T. GRABS, King, N. C. In this case the invention has reference to a new and improved fastener for bed-slats, the object in view being to insure that the slat will be held with absolute security and yet to avoid so increasing the cost of the bed as to render the use of the improvement undesirable.

NON-REFILLABLE BOTTLE.—J. C. ROSENKRANZ, Brooklyn, N. Y. When the bottle is filled, a valve is placed in position therein and then the stopper is introduced and locked in the mouth portion of the neck and an auxiliary stopper is fitted in the opening of a glass stopper. When liquid is to be poured, the auxiliary stopper is removed, and as the mouth is turned downward the valve unseats and engages with the bottom of the glass stopper. The liquid from the bottle then passes through the slots in the stopper to its recessed portion and thence to the opening in the glass stopper.

WATERING APPARATUS.—J. R. GOODWIN and W. C. BROWNE, Savannah, Ga. In general effect this device is entirely automatic, the tank of the apparatus filling itself every day and turning on the water of the supply-pipe for a predetermined period, so that the water may be used elsewhere. The tank acts not only as a motor for automatically turning water on and off for some other part of the premises, but may act as a waterer for plants in its immediate vicinity.

METALLIC LATH.—V. MOESLEIN, New York, N. Y. This lath is produced from a blank in the form of a piece of sheet metal provided with spaced rows of slots. Each of the slots produced in the blank forms a pair of tongues arranged so that they are equally distributed over the sheet-metal lath, to support the plaster uniformly. In making the sheet-metal lath suitable cutters and dies are used and by these means the tongues do not interfere with each other when struck up by the dies.

TOY CAP-PISTOL.—W. J. TURNBULL, New Orleans, La. The purpose in this device is to provide a rapid-fire toy cap-pistol of effective construction, and further to provide a construction which can be operated as rapidly as the finger can be drawn back and forth and wherein the feed of the cap-tape will be positive and uninterruptedly responsive.

SCALE.—J. H. CARR, Dubuque, Iowa. Mr. Carr's improvement relates to scales for weighing small articles, such as letters, the scales being especially adapted for use in connection with a part or member of a bottle, package or container of any kind. The object is to supply an article which may be used advantageously on bottles, etc., such as on ink-bottles, the scales affording a convenient means for weighing letters and small articles.

GAME APPARATUS.—F. F. HONECK, Chicago, Ill. The intention of the designer is to provide a new and improved parlor-game apparatus, illustrative of the game of base-ball. The apparatus is provided with a game-board in the form of a shallow tray having a central compartment, representing a base-ball field. It also comprises two sets of contrasting pegs, and dice, with means for throwing the dice and scoring the play. The game can be played by two or more persons.

GAME-BOARD.—H. BUSCH and A. JAEGER, Brooklyn, N. Y. A new game is provided by this invention which is not only interesting, but also requires a considerable amount of skill in playing. The game is called the "Blue and Gray." A novel construction of board is used on which movable devices or men are employed, representing soldiers of opposing armies.

SUBMARINE BOAT.—H. H. MORRELL, New Suffolk, N. Y. The primary object of the invention is to provide certain useful improvements in submarine boats whereby a convenient means is afforded for the escape of the occupants in case the boat becomes disabled and incapable of rising to the surface, these means also permitting a diver or other person to leave the boat for investigation or other purposes.

OUTSIDE-SASH-SECURING DEVICE.—W. M. REELY, Missoula, Mont. In the present invention the object is to provide an efficient sash-fastener which will permit the sash to be readily put in place and secured from the inside, thereby dispensing with ladders on the outside of the building, and also avoiding marring of the window-frame with screws, hooks, or the like.

WATER-BOILER, SKIMMER, AND OIL-SEPARATOR.—W. H. JOHNSON, Waco, Texas. Mr. Johnson's invention is in the nature of a new and improved means for automatically skimming and separating oil and other impurities from steam condensations and for reboiling the impure waters, so as to separate the oil and other impurities therefrom, whereby to render the waters pure and clear, and especially adapted for making artificial ice.

PROCESS OF COOLING, DRYING, AND PURIFYING AIR.—W. L. MOORE, Washington, D. C. Prof. Moore in this invention provides a process for cooling, drying, and purifying the air in houses, railway-coaches, hospitals, hotels, and other places and for the keeping of meats, produce and the like. The process comprehends the steps of progressively cooling air by subjecting it first to the temperature of melting ice and then to the lower temperature of a freezing mixture, whereby the fall of the air by gravity is so energized as to stimulate its active movement without forcing apparatus, the air being progressively cooled and dried and made to flow with the acceleration due to such cooling.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4111.—For a machine for planing and sanding hardwood floors.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4112.—For manufacturers of agricultural and horticultural machinery.

Morgan Emery wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4113.—For machinery for manufacturing aluminium.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4114.—For firms who fit up dock yards for government work.

Coin-operated machines. Willard, 284 Clarkson St., Brooklyn.

Inquiry No. 4115.—For dealers in numbers and letters for placing on houses and streets.

Blowers and exhausters. Exeter Machine Works, Exeter, N. H.

Inquiry No. 4116.—For makers of portable machine saws for felling trees.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4117.—For the manufacturers of a gasoline or kerosene engine called the Abenique.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4118.—For manufacturers and inventors of vending machines.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4119.—For dealers in powerful and first-class telephone transmitters and receivers.

Metal cut, bent, crimped, embossed, corrugated; any size or shape. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 4120.—For makers of filtering tubes for water.

WANTED.—Foundry foreman. Address with references and salary required. Foreman, Box 773, New York.

Inquiry No. 4121.—For makers of auto-trucks for hauling lumber.

Machine Work of every description. Jobbing and repairing. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4123.—For manufacturers of iron specialties.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 4123.—For a machine for destroying quack grass.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadrigs Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4124.—For the manufacturers of the machine for cutting paper covers for milk bottles.

Crude oil burners for heating and cooking. Simple, efficient and cheap. Fully guaranteed. C. F. Jenkins Co., 1103 Harvard Street, Washington, D. C.

Inquiry No. 4125.—For copper wire with an insulation that will stand a temperature of about 300 degrees F. or more, the insulating material not to increase the diameter of the wire more than about 75 per cent.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and band organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4126.—For the manufacturers of the "front-cut rear-delivery automobile harvester."

We manufacture anything in metal. Patented articles, metal stamping, dies, screw mach. work, etc. Metal Novelty Works, 43 Canal Street, Chicago.

Inquiry No. 4127.—For makers of power machinery for making fish nets.

Experienced mechanical draughtsman wanted. Permanent employment assured to rapid and accurate draughtsman. Mill Work, Box 773, New York.

Inquiry No. 4128.—For the inventor or manufacturers of a machine used for folding headache powders.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4129.—For manufacturers of Home Savings Boxes.

Contract manufacturers of hardware specialties, machinery stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., 778-784 W. Lake Street, Chicago.

Inquiry No. 4130.—For dealers in pigments, also for dealers in glazed stone and glass bottles.

WANTED.—A competent superintendent, with a knowledge of drafting, for a growing manufacturing business in automobile parts and gears. Address Superintendent, Box 773, New York.

Inquiry No. 4131.—For dealers in machinery for use in optical plants.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $5. Munn & Co., publishers, 361 Broadway, N.Y.

Inquiry No. 4132.—Wanted, catalogues, price list and trade discounts for wire, fittings, sundries and complete plants.

NOTICE TO TUNNEL CONTRACTORS.

Sealed proposals marked "Bid for Tail Race Tunnel" will be received by the undersigned until noon, May 11, 1903, for the construction of a tail race tunnel for the Toronto and Niagara Power Co., of Toronto, Ontario. Plans and specifications for this work are on file, and can be seen after March 30, 1903, at the company's offices at Home Life Building, Toronto, Ontario, and Niagara Falls, Ontario, or office of F. S. Pearson, No. 29 Broadway, New York, Room 720. The right is reserved to reject any or all proposals. Frederic Nicholls, Vice-President and General Manager, Home Life Building, Toronto, Ontario.

Inquiry No. 4133.—For manufacturers of machinery for making steel lead, lead pipe, lead syphons or traps for sewerage work and collapsible lead tubes for holding india rubber solution, toilet preparations, etc.

Inquiry No. 4134.—For manufacturers of spring wire covered with black silk.

Inquiry No. 4135.—For manufacturers of roofing and school slates.

Inquiry No. 4136.—For makers of cupolas that will melt from 3,000 to 6,000 pounds of iron in 1½ to 2½ hours.

Inquiry No. 4137.—For manufacturers of webbing suitable for halters for horses.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(8978) R. T. B. writes: Will you please inform me if 1,000 feet of natural gas as measured by meter, meter being fed from gas mains where the pressure is four ounces, will measure the same number of feet when the pressure is but two ounces in the gas mains? If not the same, what will be the difference in the number of feet? A. The meter will give the largest volume of free gas at the higher pressure; and if you are buying gas at 4-ounce pressure by meter, you will obtain more free gas than if measured under 2-ounce pressure. The difference is only about 0.005 of the volume as measured by the meter.

(8979) F. P. asks for SUPPLEMENT, No. 600, containing a 1 horse power dynamo which can be turned by two or four men. Will you please let me know if by the application of any mechanical movement, it could be turned by one man for a couple of hours? A. There is no possible way in which a man can do 1 horse power work for even a moment. Engineering authorities agree that a strong man can do about ⅛ of a horse power of work. And there is no machine possible by which a man can increase the horse power of work which he can do. On this point there is much popular ignorance of the function of a machine. A machine may enable a man to move a weight which he could not otherwise move, but he must move it with proportionate slowness. Thus, if a man could just move a weight of 300 pounds one foot a second, by the aid of a machine he might move a weight of 1,200 pounds, but he would only move it with a velocity of 3 inches per second, disregarding the friction. Or on the other hand, he might by a machine move a weight of 100 pounds, and could then move it 3 feet a second. But by no possible application of machinery could the man's work become greater than 300 foot-pounds per second. Of course, this is a mere illustration, since no man could do as much as 300 foot-pounds of work per second. A horse power is 550 foot-pounds per second, and a man's power does not much exceed 70 foot-pounds per second. It will be evident then that if a dynamo requires 1 horse power to drive it, not less than eight men would be required to do this work, for any length of time.

(8980) G. L. asks: 1. In making estimates on atmospheric pressure, using as one atmosphere 15 pounds and two atmospheres 30 pounds, what would be the pounds pressure at 3, 4, etc., up to 25 atmospheres? A. The air pressure is any number of atmospheres less one, multiplied by 15. Thus, 10 atmospheres less 1 is $9 \times 15 = 135$ pounds, and so on. 2. What would be the degrees of heat required (without loss) to get 1, 2, 3, etc., up to 25 atmospheres of steam from water at 32 degs. and 60 degs.; and the increase of pressure at each change in same sized chamber? A. The total number of degrees from 32 degs. to 212 degs. in steam at atmospheric pressure is 180 degs. Fah.; at 2 atmospheres by gage, 240 degs.; 3 atmospheres, 273 degs.; 4 atmospheres, 291 degs.; 5 atmospheres, 305 degs.; and so on at a decreasing rate, each atmosphere being 14.7 pounds. See steam table of pressures, temperatures, heat units, etc., in Haswell's "Engineer's Pocket Book," $4 by mail.

(8981) S. B. asks: 1. Will you please tell me a good way to amalgamate a "Daniell zinc" for Fuller battery? A. A battery zinc is amalgamated by first dipping it into diluted sulphuric acid; acid 1 part, water 10 parts. Pour the acid into the water with constant stirring. When the zinc is well cleaned, dip it into mercury, or apply mercury to it in some other way. If the mercury does not readily adhere to the zinc in any spots, dip again into the acid and rub the mercury upon the bare spots. 2. What causes the following troubles? I have four carbon sal-ammoniac (open-circuit) batteries; in cool weather they become very weak, but in warm weather they work all right. A. If your cells do not work well in a cold place, try them in a warm place.

(8982) G. H. S. asks: 1. Please tell me if it is necessary to have alternators running in synchronism before connecting them in parallel, and if so, why? A. Alternators are brought into synchronism before they are connected in parallel. If a machine has a low armature reaction a heavy cross current may be produced if they are out of step. If the armature reaction is high, there is less danger of a heavy cross current due to lack of synchronism, or difference of wave form. This is treated at some length in Cudin's "Standard Polyphase Apparatus and Systems." 2. What is a "copper voltameter," and how shall I measure the strength of a current by means of such an instrument? A. A copper voltameter is a jar containing two copper plates and a solution of copper sulphate. When a current is sent through the jar, one plate increases and the other diminishes in weight, in proportion to the strength of the current and the time it flows. One ampere will deposit 0.0003281 gramme in one second. The instrument is not used for measuring currents practically. The amperemeter has taken its place. A zinc voltameter was once employed as an electric meter, but this has given place to the recording watt-meter.

(8983) L. D. G. asks: If a cannon is exploded by electricity on an island a thousand miles from any living being, does it produce sound? A. The answer to your inquiry depends upon the definition given to "sound." It has two definitions. One is: "Sound is the sensation produced in the mind through the ear by certain rates of vibration of elastic bodies." In this sense a sound does not exist unless there is an ear to receive and transmit the sensation to the brain. The other definition is: "Sound is a mode of vibration capable of affecting the auditory nerve." In this sense a sound exists wherever there is a vibrating body whose vibration would affect the auditory nerve, if there were an ear to receive these vibrations and transmit them to the brain. Sound is, in the first sense, physiological; in the second sense, it is physical. In the first sense of the word the cannon on a desert island does not produce a sound. In the second sense of the word the cannon does produce a sound, whether any ear is near enough to hear it or not.

(8984) F. W. G. asks: 1. How many pounds pressure is there at a faucet, if 17 quarts of water pass through a 3-16-inch hole, and 22 quarts through a ¼-inch hole in one minute? A. Seventeen quarts of water passing through a 3-16-inch hole per minute indicates a pressure of 18 pounds per square inch; 22 quarts passing through a ¼-inch hole, 10 pounds pressure per square inch. At 18 pounds pressure you will need a 7-16-inch nozzle for a quarter horse power. At 10 pounds pressure you will need a ⅝-inch nozzle. 2. Can I get one-quarter horse power at such pressure? If so, please state what size wheel I must use. A. See SUPPLEMENT, No. 1049, for illustrated description of small water motors and their power; 10 cents mailed. 3. I have an Edison electric motor taken out of a phonograph, the same style as is illustrated in Hopkins' "Experimental Science," page 731. The armature has forty coils. Can I use the armature in a sheet-iron field, like the simple motor, page 498, in Hopkins' "Experimental Science"? Will it be as powerful as the simple electric motor? A. The armature from the phonograph is suitable for the sheet-iron field, page 498, "Experimental Science." Use No. 16 cotton-covered wire for the field pieces.

(8985) C. O. G. asks: Could you give me the recipe for a pocket battery suitable for a small induction coil? A. A paste for a dry cell may be made by taking oxide of zinc, 1 part; sal-ammoniac, 1 part; plaster of Paris, 3 parts; chloride of zinc, 1 part; water, 2 parts. All these, by weight, are mixed. The sal-ammoniac should be first dissolved in the water; the other chemicals are not very soluble.

(8986) W. G. L. says: May I ask one or two questions regarding the construction of a kaleidoscope? 1. If the diameter of the box containing objects to be reflected is 4 inches, what length should cylinder containing the reflectors be? A. The length of the tube of a kaleidoscope seems to be a matter of choice simply. We have one nearly 4 inches in diameter and 8 inches long, and one 2 inches in diameter, which is much longer, while another comes between the two both in length and diameter. 2. What kind of a glass is best for reflectors—smoked glass or mirror glass? A. A common glass painted black on one side is most often found in these instruments. We never saw one with a plate of mirror. 3. For a 4-inch diameter disk, would three or four reflectors be the more effective? A. Whether two or more reflectors be used is determined by the figure to be formed in the instrument, and not by its size. If two reflectors are used, placed at an angle, the field is star-shaped, with as many points as the angle of the glasses is contained in 360 deg. If three pieces of glass are used, an equilateral triangle is formed in the center of the field of view, and at each of its angles are to be seen five other triangles like it. We have never seen four plates used as reflectors. The whole thing costs so little besides time to make that you can best determine for yourself the various effects by a paste pot and some cheap cardboard. 4. The outside disk is ground glass, and the inside one plain. Are the reflectors (rather the end of the reflectors) supposed to touch the inside disk, or merely close to it without actual contact? A. It can make no difference whether the ground glass disk touches the reflectors or not. The colored objects are not in view except when they are [illegible] the angle of the reflectors, and this is but a small part of the angle of the box in which they roll about.

(8987) C. P. asks: 1. Can oxygen be condensed in small quantities? A. Oxygen can be compressed to any extent desired. It is compressed in large quantities every day. 2. How much space would one-half hour's supply occupy in cubic inches? A. From 18 to 20 cubic feet of oxygen will be required by an average man for a half-hour's full breathing; 20 cubic feet compressed to one cubic foot would have a pressure of 300 pounds per square inch. 3. Is oxygen used practically for any purpose? A. Oxygen is used for certain purposes, though generally it is sufficient to use it as it exists mixed with nitrogen in the air. It is employed undiluted in the manufacture of platinum articles; in the calcium light; for purifying illuminating gas; and in medicine. It would be more extensively employed if it could be produced more cheaply. 4. Do divers still use air pump or oxygen? A. Divers have the air pumped down to them. 5. Is oxygen very expensive? If so, about how much? A. Compressed oxygen may be had for about 15 cents per cubic foot.

(8988) J. C. McC. asks: I would like to know if an incandescent lamp requires more current toward the end of its life than at the beginning. A. If an old incandescent lamp is to be kept up to candle power, more voltage must be put on to force the necessary current through it, since its resistance has increased by the decrease in the size of the filament. With no increase of pressure the light of the lamp decreases, since less current flows. It is poor economy to use such a lamp. It should be replaced by a new lamp. Most users of lamps keep them in service too long.

(8989) T. K. asks: Is it not a fact that since the earth was thrown off from the sun, or since the sun first appeared to shine upon the earth, there has been but one continuous day and night, which never "ends and begins," as the common saying is and the almanacs state? A. In a sense the fact is as stated, but it is not the common sense. It is a matter of common experience that day and night succeed each other at the place where we live. The earth presents one-half to the sun all the time. This half is every moment changing. This half is the half upon which it is day. Night is caused by the shadow of the earth, which extends away into space from the sun. When we enter this shadow, we have night. This is the common and universal usage of the words "day" and "night." There is no day or night for the earth outside of the earth's atmosphere. The energy of the sun does not become *light* till it strikes some material. Then its vibrations are changed so the eye may perceive them when they enter the eye.

(8990) F. S. L. writes: 1. What is meant by the sparking limit of the load of a dynamo? A. We do not know what "sparking limit" is, unless it be the distance beyond which a spark will not pass through the air. 2. What causes sparking? A. Sparking is caused by difference of potential. 3. What causes the neutral points in a dynamo to shift when a current is flowing in armature conductors? A. The rotation of the armature causes the lines of force in the space between the poles to be curved in the direction of the rotation, hence the brushes must be rocked forward till the position of least sparking is found. 4. What limits the output of a constant potential dynamo? A. The rise of temperature in the wires, as also the resistance of the external circuit and other minor causes, limits the output of a dynamo. Why do carbon brushes spark less than copper brushes under the same conditions? A. A brush in the neutral position, and with good contact with the armature bars, does not spark.

(8991) L. G. says: Please tell me what amount of water can be evaporated per pound of coal in the following manner: 1. *Surface* evaporation in a tank 10 feet by 10 feet and 12 inches deep? A. The surface evaporation from a tank depends upon the surface extension of its bottom, to enable it to absorb the greatest amount of the heat of combustion. The greatest possible amount of evaporation may be from 12 to 13 pounds of water per pound of coal. 2. *Surface* evaporation in a tank 10 feet by 5 feet and 24 inches deep? A. There will be but little difference as to the depth, after the water has been raised to the assigned evaporating temperature. 3. *Boiler* evaporation at 10 pounds pressure? A. Boiler evaporation at 10 pounds pressure is about 11 pounds water per pound of coal. 4. *Boiler* evaporation at 100 pounds pressure? A. Boiler evaporation at 100 pounds pressure, 9 to 10 pounds. What amount of water can be converted into steam per pound of coal in the following manner: 5. By ejecting water with a temperature of 222 degs. Fahr. into space? A. About 6 per cent of the volume, according to the condition of the atmosphere. 6. By ejecting water with a temperature of 312 degs. Fahr. into space? Are there any books that will give this information? A. About 12 per cent of the volume, according to atmospheric conditions. See a book on heat by Box, $5 by mail.

(8992) W. L. asks: What is the pressure in pipe organ bellows per square inch? Is there a difference in pressure for the reed and flute stops? A. The usual pressure in the bellows of a pipe organ varies from 3 pounds to 7 pounds, and possibly to 9 pounds per square inch. The great, swell, and choir organs usually have three pounds. The solo, trumpets, and tubas may run to 5 pounds, 7 pounds, and even to 9 pounds. Reed and flute stops do not have different pressures, as is shown by the

statements above. Some organs have subsidiary bellows to allow a variation of pressure.

(8993) F. F. W. asks: I would like you to give me the dimensions of an 11-inch Wimshurst machine, size of tinfoil sectors, number on each plate, size inside and out of Leyden jars, and whether or not it is large enough for X-ray experiments; if not, the size of one for such. Also a way for cutting glass circles and perforating plates for spindles. Also how to make collecting combs for the machine. A. A Wimshurst machine with 11-inch plates will not actuate an X-ray tube powerfully enough for any real work. If our correspondent would make an effective apparatus, he should make an 8 or 12-inch coil. We cannot advise him to attempt cutting glass plates unless he is an expert in cutting glass. He then only needs a round pattern and to cut around it with his diamond. The hole is made through the center by the sharp corner of a broken file wet with turpentine in which all the camphor it will take has been dissolved. SUPPLEMENT 548 contains plans for making a good Wimshurst machine. We should advise plates as large as 24 inches.

(8994) G. H. asks: In the experiment of the electrolytic decomposition of water to the two gases, hydrogen and oxygen, can you give me any figures of the size of plates or plate surface necessary to produce one cubic foot of oxygen gas at atmospheric pressure in one hour and power required, and would such gas raise under pressure a gasometer after the style of a gasometer in a gas works? A. The size of the plates is not important in the decomposition of water by the electric current. The plates are of platinum, and a large plate is too expensive. You will require 136 coulombs to decompose 1 cubic foot of oxygen in one hour. At least 1.5 volts must be used; more will give less heat, since fewer amperes will be needed. If you use 10 volts and 14 amperes, you will have a fair result. The gas produced will be like any other gas in pressure and other properties. This method of producing oxygen is a most expensive one. The chemical way is much better.

(8995) G. O. H. asks: I have been amusing my grandchildren by magnetizing the blades of their pocket-knives with a horseshoe magnet, using the "single-touch," as I believe it is called; drawing the magnet straight forward, and returning in the same direction, using the same pole a number of times without change. Is there a simple process better than this? A. The best and simplest way to magnetize a piece of steel with a magnet is to draw the steel off one pole of the magnet, perhaps ten times in the same direction; then draw the other end of the piece of steel off from the other pole of the magnet the same number of times. The magnetism is fixed by forcibly pulling the piece of steel through and away from the field of the magnet.

(8996) R. C. asks: Would you kindly explain to me the workings of the radiometer? A. The radiometer consists of a bulb of glass exhausted to a vacuum of about one centimeter of mercury. Within are two cross arms turning upon a pivot. These arms carry disks of mica, which are covered on one side with lampblack. The other side is metallic, shiny. When heat falls upon the vanes, the black side absorbs more readily than the metallic side and becomes hotter. The molecules of the gas remaining in the bulb coming in contact with the blackened surfaces are heated more than those striking the shining surfaces, and consequently rebound from the blackened sides of the vanes with more force than from the shiny side, thus causing a greater pressure upon the blackened faces. The vanes being able to move revolve by the reaction, their blackened faces moving away from the source of heat. If the vacuum is either too high or too low, no motion is produced. If exposed to an intensely cold body, the vanes revolve in the opposite direction.

(8997) W. W. L. asks: A train going at the rate of one mile a minute, with a cannon on one of the cars, loaded so as to give a firing velocity of one mile per minute, the cannon to be fired while the train is going at that rate in the opposite direction. How far apart will the train and the cannon ball be at the end of one minute? The resistance of the air is not taken into consideration. A. If a train is going at the rate of a mile a minute, and a ball be fired from the train with a velocity of a mile a minute in the opposite direction to that of the train, it will in one minute be one mile away from the train. This is because the cannon threw the ball a mile a minute. The train with the cannon on it, and the ball both before and after it was discharged, traveled by its inertia a mile in a minute in one direction, while the force of the powder sent the ball a mile in a minute in the opposite direction. These two motions will put the ball and the train a mile apart in a minute. But if you stood by the side of the train as the cannon was discharged, you would seem to see the ball fall from the mouth of the cannon to the earth and the train simply move away from it one mile in one minute. 2. Again, if the cannon were fired the same way the train was going, how far would the ball be from the cannon at the end of one minute? A. If the cannon were fired in the same direction in which the train was going in one minute the ball would be one mile ahead of the train, since it would have the velocity of one mile a minute by the inertia of the train and a velocity of one mile a minute by the force of the powder. It would actually have the velocity of two miles a minute.

(8998) R. B. C. asks: What causes a change of direction of the current in a simple dynamo during each revolution of the armature? A. The dynamo produces a current in the armature coils by whirling them across the lines of force of the field. These cross from one pole piece to the other through the armature. A coil of wire when flatwise receives the lines of force in one direction through it. When it has turned through a half circle, it receives these lines in the opposite direction. The current produced by the lines passing through the coil in one direction is the reverse of the current produced by the same lines passing through the same coil in the opposite direction. So that the direction of the current from a coil of the armature changes each half revolution. The current is called alternating. A commutator of a direct current machine acts to reverse every other one of the alternating impulses, and so the current comes out constantly in one direction. All dynamos generate alternating currents in their armatures. Dynamos with commutators give direct currents outside. You would understand this much better by reading some book, say Swoope's, price $2, or Jackson's "Elementary Electricity," price $1.50 post paid.

(8999) H. J. S. asks: Supposing the diameter of the moon's orbit was reduced so that the moon would revolve around the earth so near to its surface that it would barely avoid scraping the mountain tops, and suppose there was no resisting atmosphere to complicate the problem. Suppose also that it was moving in its orbit at its present rate of motion. What would be the time required for one revolution around the earth? Would the earth's gravitative power draw the moon to itself, or would its momentum, or centrifugal tendency, send it back into the heavens to revolve eventually in the same orbit that it now does? A. If the moon or any other body were to revolve around the earth so as just to escape its surface, its time of revolution would be 1 hour 24 minutes 39 seconds. This may be computed as an application of Kepler's Third Law, for which consult any astronomy. The supposition that the moon in this position should move with its present rate of motion cannot be allowed. It could not move with its present rate and be so near the earth. It would fall into the earth very speedily. Its present rate of motion is exactly right for its present distance from the earth. To prevent it from falling into the earth at the nearer distance supposed, its rate of motion must be greatly increased, so that it would go around the earth in the time given above. As to what would happen later on, what you will say to that depends upon whether you accept Darwin's hypothesis of tidal evolution. Into this question we will not enter, since we have not the space for it. We will refer you to Young's "Text-book of General Astronomy," price $3.50, or to Ball's "Story of the Heavens," price $3.50, the last chapter of which is devoted to this subject.

(9000) C. H. asks: 1. Would you kindly let me know of some cheap way of making oxygen that could be used for an oxyhydrogen flame? A. There is no cheap way of making oxygen. It is commonly made by heating a mixture of equal parts of chlorate of potash and dioxide of manganese in a metallic retort, but is not a safe operation except for a person with some knowledge of chemistry. 2. Does hydrogen mixed with oxygen give much more heat than mixed with air? A. Hydrogen gives a hotter flame with oxygen than with the air. It is not, however, used for the oxyhydrogen blowpipe unless for metals which melt above the temperature required for platinum. Street gas is commonly employed with oxygen in the so-called oxyhydrogen blowpipe, and this flame is hot enough to melt platinum. 3. Kindly let me know will sand readily melt when heated with the above gases, or does it require to be mixed with some other substance, and if so kindly mention which is cheapest and how mixed? A. Silica (sand) is not melted by the oxyhydrogen flame. The heat of the electric arc is employed for that purpose. If, however, the sand be mixed with an alkali, soda or potash, as in making glass, it may be melted in an ordinary furnace. For this, see works upon glass making.

(9001) R. R. wants to know how to bend flash boiler tubing without flattening ends. A. For making bends in ⅝ extra strong iron pipe as small as shown in your sketch, you must heat the parts of the pipe represented by the bend and slowly bend it to the required shape. If it flattens a little, it may be squeezed sidewise in a vise to keep it round. A good blacksmith can bend such pipe with very little distortion.

(9002) W. C. asks for a method of "setting" the colors of pressed flowers. A. Either dust salicylic acid over the plants as they lie in the press, or prepare a solution of 1 part of salicylic acid in 14 parts of alcohol; soak blotting paper in this solution, and place a sheet so soaked above and below the flowers when pressing.

(9003) J. E. W. asks: What is the best material for putting a bright finish on hasps, hooks, and staples? A. Charcoal mixed with the sawdust in the tumbling barrel, without oil, is much in use for brightening tumbled work. The oiling should be a separate operation after the cleaning, which may be done with sawdust wet with linseed oil.

NEW BOOKS, ETC.

PERSPECTIVE DRAWING. Instruction Paper. American School of Armour Institute of Technology. Chicago. 1902. Pp. 69. 8vo.

The correspondence schools are playing so prominent a part in education, that their publications deserve attention. It must be confessed that the presentation of the subject in this book is clear, and particularly well adapted for school purposes.

THE CHEMISTRY OF INDIA RUBBER. Including the Outlines of a Theory of Vulcanization. By Carl Otto Weber, Ph.D. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Company. 1903. 8vo. Pp. x, 314. Price $5.50.

It is the purpose of this book to deal with the analytical methods which are most exclusively the work of R. Henriques, more particularly as regards rubber substitutes, so called, and the author's researches, chiefly concerning India rubber itself, and the vulcanization problem. This refers to work done within the last ten years. Before that time India rubber analysis, if it existed at all, was unknown to the outside world. Manufacturing processes as such, have not been dealt with. To have done so would have resulted in the destruction of the unity and aim of the work. The book is probably the best on the chemistry of India rubber which has so far been published.

THE ART OF ILLUMINATION. By Louis Bell, Ph.D. New York: McGraw Publishing Company. 1902. 8vo. Pp. 345.

The book deals not with the problem of distributing the illuminants but with their application, and treats of the illuminants themselves only in so far as a knowledge of their peculiarities is necessary to their intelligent use. To compress the subject within reasonable bounds, the general principles have been discussed rather than concrete examples of artificial lighting. A book of this character should tend to correct some of the commoner errors and failures in illumination.

FACTORY ACCOUNTS. Their Principles and Practice. By Emile Garcke and J. M. Fells. London: Crosby Lockwood & Son. New York: D. Van Nostrand Company. 1902. 12mo. Pp. xviii, 248. Price $3.

No doubt this book was the first attempt to discuss scientifically the principles relating to factory accounts, and the methods by which those principles can be put into practice and made to serve important purposes in the economy of manufacture. The authors are probably correct in their statement that warehousemen and business-men are for the most part content to accept accounts which are not capable of scientific verification and which can be regarded only as memoranda of transactions. In this present fifth edition some matters of factory routine and registration, not previously dealt with, are included. Although the book treats the subject largely from the English standpoint, it should be welcomed by American factory proprietors.

THE STEAM TURBINE. By Robert M. Neilson. London, New York, and Bombay: Longmans, Green & Co. 1902. 8vo. Pp. xii, 163. Price $2.50.

Since the steam turbine is likely to be extensively used in the future, a book on the subject should be of unusual value. Literature on the turbine has so far consisted chiefly of descriptions of the principal features only, or of accounts of the results of tests. The author has endeavored in this book to describe, not only the principal parts of leading types of steam turbine, but also small details which have such preponderating influence in determining success or failure. The mathematical reasoning contained in the book is simple.

AN ELEMENTARY TREATISE ON THE MECHANICS OF MACHINERY. With Special Reference to the Mechanics of the Steam Engine. By Joseph N. LeConte. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. 8vo. Pp. x, 311. Price $2.25.

The author tells us that this book is the outcome of a course of lectures on kinematics and the mechanics of the steam engine. The first two parts embody the more important principles of what is generally called the kinematics of machinery, though in many instances dynamic problems which present themselves are dealt with, the real purpose of the book being the application of the principles of mechanics to certain problems connected with machinery. The third part treats of the mechanics of the steam engine, since that machine is perhaps the most important from the designers' point of view.

REAL THINGS IN NATURE. A Reading Book of Science for American Boys and Girls. By Edward S. Holden, Sc.D., LL.D. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1903. 16mo. Pp. xii, 443.

This is a children's book intended to be as useful and interesting as it can be. It explains in an easily-grasped way something of scientific things, which every boy and every girl sees. The field covered is wide. The author has divided his work into nine books. The first deals with Astronomy; the second with Physics; the third with Meteorology; the fourth with Chemistry; the fifth with Geology; the sixth with Zoology; the seventh with Botany; the eighth with the Human Body; and the ninth with the Early History of Mankind. The boy who reads this book or studies it from beginning to end ought to know more than many of his elders.

CHAMBERS'S CYCLOPEDIA OF ENGLISH LITERATURE. New Edition by David Patrick, LL.D. A History, Critical and Biographical, of the Authors in the English Tongue from the Earliest Times Until the Present Day. With Specimens of Their Writings. Vol. I. London, Edinburgh, and Philadelphia: J. B. Lippincott Company. 1900. Pp. 832.

Most of our readers are probably familiar with the old Cyclopedia of English Literature edited by Dr. Chambers. The work was the first of its kind published in England, giving as it did a conspectus of English literature by a series of extracts from the more memorable authors, set in a biographical and critical history of literature itself. In this new edition, which may well be regarded as an entirely new enterprise in itself, the essential plan of the original cyclopedia has been adhered to, but considerably developed. Old English literature, formerly discussed in three pages, now occupies more than ten times the space; middle English has no longer some twenty pages allotted to it, but ninety. In the first volume alone, over fifty authors not named or hardly named in the older issues, are treated and illustrated by selections from their works. One of the characteristically modern features of the new Cyclopedia is to be found in the work of specialists. Dr. Stopford Brooke, Andrew Lang, Sidney Lee, George Saintsbury, and Edmund Gosse are a few of the more prominent critics who have contributed special articles on men with whose writings they are intimately acquainted. The historical surveys prefixed to the several sections were unknown to the old Cyclopedia, and constitute a most valuable addition to the new book. The same holds good of a large number of critical and biographical articles. Summing up this new enterprise as a whole, it may be said that the aim has been to carry out Dr. Chambers's plan more perfectly than he was himself able to, and to produce a cyclopedia more fully representative of our present and past literary history at the commencement of the twentieth century.

AMERICAN ELECTRIC AND AUTOMOBILE PATENTS MONTHLY. Compiled by James T. Allen, Examiner United States Patent Office. Washington, D. C.: American Patents Publishing Company. Price $5 per annum.

Mr. Allen has undertaken the task of preparing a compilation of the patents included in over four hundred sub-divisions of the Patent Office classes. The publication contains digested patents covering the subjects of electro chemistry, electric lighting, electric railways, electric signaling, electric conductors.

N. W. AYER & SONS' AMERICAN NEWSPAPER ANNUAL. 1903.

The Ayer Annual comes to us this year, portly and complete as ever. It contains a carefully prepared list of papers and periodicals published in the United States, Territories, and Dominion of Canada, with valuable information regarding their circulation, issue, date of establishment, political or other distinctive features, names of editors and publishers, and street addresses in cities of fifty thousand inhabitants and upward, together with the population of the counties and places in which the papers are published, according to the United States Census of 1900. In this new volume will be found a most valuable list of newspapers and periodicals published in Hawaii, Porto Rico, Cuba, and the West Indian Islands, which list, we are assured, is compiled from the latest obtainable information. A description of every place in the United States and Canada is given in which a newspaper is published, and likewise some brief account of railroad, telegraph, express, and banking facilities. Colored railroad maps to the number of fifty-eight indicate the location and number of railroads of the United States and its possessions, Canada, and the West Indies. The vote of states and counties at the Presidential election of 1900 likewise finds a place in the volume. In the latter portion of the book will be found a list of the newspapers of the United States and Canada arranged by counties, with a description of each state, territory, province and county, giving the location, character of surface and soil, chief products and manufactures. Separate lists of railroads and agricultural publications will prove of help to the manufacturer.

ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE FISCAL YEAR ENDED JUNE 30, 1902. Supplement to the Report of the Chief of Engineers. Reports of the Mississippi River Commission and Missouri River Commission. Washington: Government Printing Office. 1902. Pp. 215.

DIVINE SCIENCE AND HEALING. By Malinda E. Cramer. A Text Book for the Study of Divine Science, Its Application in Healing, and for the Well-being of Each Individual. San Francisco. 1902. Pp. 293.

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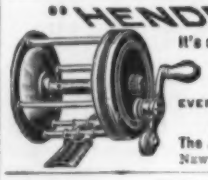

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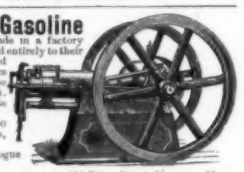

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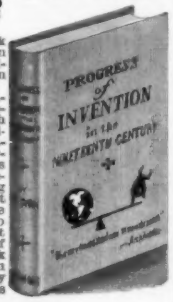

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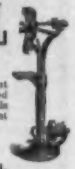

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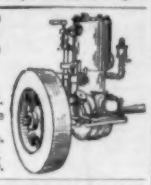

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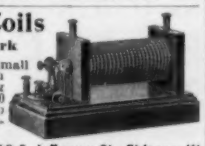

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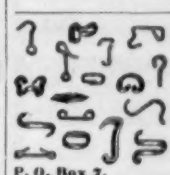

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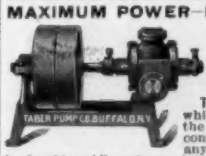

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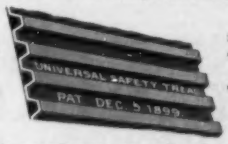

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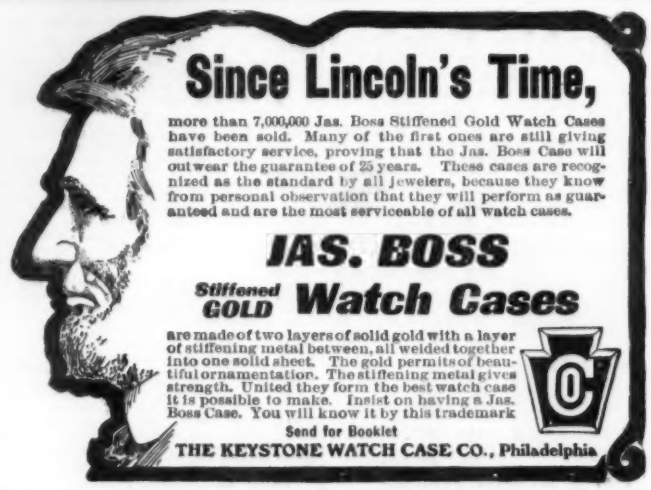

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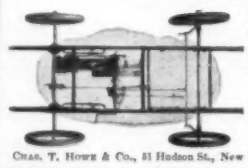

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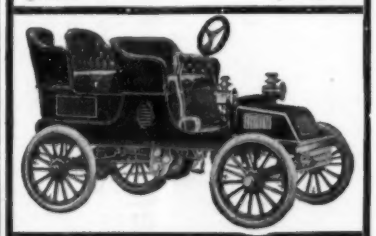

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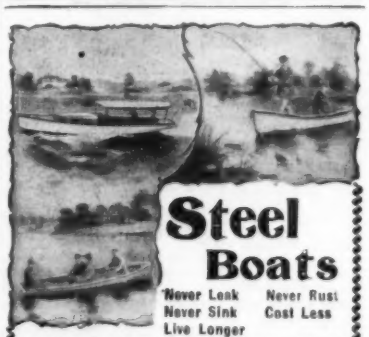

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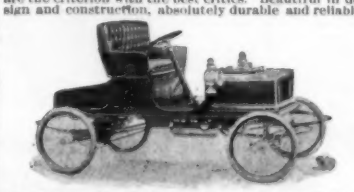

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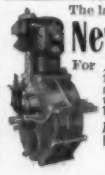

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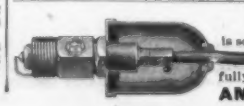

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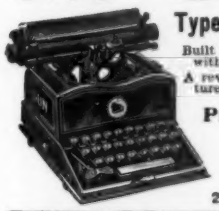

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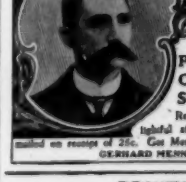

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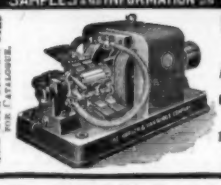

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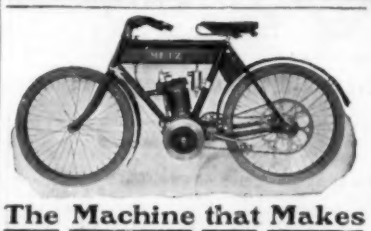

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